110TH CONGRESS
2d Session
HOUSE OF REPRESENTATIVES
REPORT
110–749

FEDERAL OCEAN ACIDIFICATION RESEARCH AND MONITORING ACT OF 2008

JULY 9, 2008.—Committed to the Committee of the Whole House on the State of the Union and ordered to be printed

Mr. GORDON of Tennessee, from the Committee on Science and Technology, submitted the following

R E P O R T

[To accompany H.R. 4174]

[Including cost estimate of the Congressional Budget Office]

The Committee on Science and Technology, to whom was referred the bill (H.R. 4174) to establish an interagency committee to develop an ocean acidification research and monitoring plan and to establish an ocean acidification program within the National Oceanic and Atmospheric Administration, having considered the same, report favorably thereon with an amendment and recommend that the bill as amended do pass.

CONTENTS

69–006

I. AMENDMENT

The amendment is as follows:
Strike all after the enacting clause and insert the following:

SECTION 1. SHORT TITLE; TABLE OF CONTENTS.

(a) SHORT TITLE.—This Act may be cited as the "Federal Ocean Acidification Research And Monitoring Act of 2008" or the "FOARAM Act".

(b) TABLE OF CONTENTS.—The table of contents for this Act is as follows:

SEC. 2. FINDINGS AND PURPOSES.

(a) FINDINGS.—The Congress finds the following:

(1) The oceans help regulate atmospheric chemistry by acting as the largest sink for carbon dioxide.

(2) The rapid increase in atmospheric carbon dioxide is overwhelming the natural ability of the oceans to absorb this gas.

(3) The influx of carbon dioxide into the atmosphere and the subsequent absorption by the oceans is changing surface ocean carbon chemistry and lowering the pH. These changes in ocean chemistry are detrimental to organisms including corals, which support one of the richest habitats on Earth, marine shellfish, and many other organisms that form the base of the food chain for many fish and marine mammals.

(4) The rich biodiversity of marine organisms is an important contribution to the national economy and the change in ocean chemistry threatens tourism, our fisheries, and marine environmental quality, and could result in significant social and economic costs.

(5) Existing Federal programs support research in related ocean chemistry, but gaps in funding, coordination, and outreach have impeded national progress in addressing ocean acidification.

(6) National investment in a coordinated program of research and monitoring would improve the understanding of ocean acidification effects on whole ecosystems, advance our knowledge of the socioeconomic impacts of increased ocean acidification, and strengthen the ability of marine resource managers to assess and prepare for the harmful impacts of ocean acidification on our marine resources.

(b) PURPOSES.—The purposes of this Act are to provide for—

(1) development and coordination of a comprehensive interagency plan to—

(A) monitor and conduct research on the processes and consequences of ocean acidification on marine organisms and ecosystems; and

(B) establish an interagency research and monitoring program on ocean acidification;

(2) assessment and consideration of regional and national ecosystem and socioeconomic impacts of increased ocean acidification; and

(3) research on adaptation strategies and techniques for effectively conserving marine ecosystems as they cope with increased ocean acidification.

SEC. 3. DEFINITIONS.

In this Act:

(1) OCEAN ACIDIFICATION.—The term "ocean acidification" means the decrease in pH of the Earth's oceans and changes in ocean chemistry caused by chemical inputs from the atmosphere, including carbon dioxide.

(2) SECRETARY.—The term "Secretary" means the Secretary of Commerce, acting through the Administrator of the National Oceanic and Atmospheric Administration.

(3) SUBCOMMITTEE.—The term "Subcommittee" means the Joint Subcommittee on Ocean Science and Technology of the National Science and Technology Council.

SEC. 4. INTERAGENCY SUBCOMMITTEE.

(a) DESIGNATION.—The Joint Subcommittee on Ocean Science and Technology of the National Science and Technology Council shall coordinate Federal activities on ocean acidification.

(b) DUTIES.—The Subcommittee shall—

(1) develop the strategic research and monitoring plan to guide Federal research on ocean acidification required under section 5 of this Act and oversee the implementation of the plan;

(2) oversee the development of—

(A) an assessment of the potential impacts of ocean acidification on marine organisms and marine ecosystems; and

(B) adaptation and mitigation strategies to conserve marine organisms and ecosystems exposed to ocean acidification;

(3) facilitate communication and outreach opportunities with nongovernmental organizations and members of the stakeholder community with interests in marine resources;

(4) coordinate the United States Federal research and monitoring program with research and monitoring programs and scientists from other nations; and

(5) establish or designate an Ocean Acidification Information Exchange to make information on ocean acidification developed through or utilized by the interagency ocean acidification program accessible through electronic means, including information which would be useful to policymakers, researchers, and other stakeholders in mitigating or adapting to the impacts of ocean acidification.

(c) REPORTS TO CONGRESS.—

(1) INITIAL REPORT.—Not later than 1 year after the date of enactment of this Act, the Subcommittee shall transmit a report to the Committee on Commerce, Science, and Transportation of the Senate and the Committee on Science and Technology of the House of Representatives that—

(A) includes a summary of federally funded ocean acidification research and monitoring activities, including the budget for each of these activities; and

(B) describes the progress in developing the plan required under section 5 of this Act.

(2) BIENNIAL REPORT.—Not later than 2 years after the delivery of the initial report under paragraph (1) and every 2 years thereafter, the Subcommittee shall transmit a report to the Committee on Commerce, Science, and Transportation of the Senate and the Committee on Science and Technology of the House of Representatives that includes—

(A) a summary of federally funded ocean acidification research and monitoring activities, including the budget for each of these activities; and

(B) an analysis of the progress made toward achieving the goals and priorities for the interagency research plan developed by the Subcommittee under section 5.

(3) STRATEGIC RESEARCH PLAN.—Not later than 2 years after the date of enactment of this Act, the Subcommittee shall transmit the strategic research plan developed under section 5 to the Committee on Commerce, Science, and Transportation of the Senate and the Committee on Science and Technology of the House of Representatives. A revised plan shall be submitted at least once every 5 years thereafter.

SEC. 5. STRATEGIC RESEARCH PLAN.

(a) IN GENERAL.—Not later than 2 years after the date of enactment of this Act, the Subcommittee shall develop a strategic plan for Federal research and monitoring on ocean acidification that will provide for an assessment of the impacts of ocean acidification on marine organisms and marine ecosystems and the development of adaptation and mitigation strategies to conserve marine organisms and marine ecosystems. In developing the plan, the Subcommittee shall consider and use information, reports, and studies of ocean acidification that have identified research and monitoring needed to better understand ocean acidification and its potential impacts, and recommendations made by the National Academy of Sciences in the review of the plan required under subsection (d).

(b) CONTENTS OF THE PLAN.—The plan shall—

(1) establish, for the 10-year period beginning in the year the plan is submitted, the goals and priorities for Federal research and monitoring which will—

(A) advance understanding of ocean acidification and its physical, chemical, and biological impacts on marine organisms and marine ecosystems;

(B) improve the ability to assess the socioeconomic impacts of ocean acidification; and

(C) provide information for the development of adaptation and mitigation strategies to conserve marine organisms and marine ecosystems;

(2) describe specific activities, including—

(A) efforts to determine user needs;

(B) research activities;

(C) monitoring activities;

(D) technology and methods development;

(E) data collection;

(F) database development;

(G) modeling activities;

(H) assessment of ocean acidification impacts; and

(I) participation in international research efforts;

(3) identify relevant programs and activities of the Federal agencies that contribute to the interagency program directly and indirectly and set forth the role of each Federal agency in implementing the plan;

(4) consider and utilize, as appropriate, reports and studies conducted by Federal agencies, the National Research Council, or other entities;

(5) make recommendations for the coordination of the ocean acidification research and monitoring activities of the United States with such activities of other nations and international organizations;

(6) outline budget requirements for Federal ocean acidification research and monitoring and assessment activities to be conducted by each agency under the plan;

(7) identify the monitoring systems and sampling programs currently employed in collecting data relevant to ocean acidification and prioritize additional monitoring systems that may be needed to ensure adequate data collection and monitoring of ocean acidification and its impacts; and

(8) describe specific activities designed to facilitate outreach and data and information exchange with stakeholder communities.

(c) PROGRAM ELEMENTS.—The plan shall include at a minimum the following program elements:

(1) Monitoring of ocean chemistry and biological impacts associated with ocean acidification at selected coastal and open-ocean monitoring stations, including satellite-based monitoring to characterize—

(A) marine ecosystems;

(B) changes in marine productivity; and

(C) changes in surface ocean chemistry.

(2) Research to understand the species specific physiological response of marine organisms to ocean acidification, impacts on marine food webs of ocean acidification, and to develop environmental and ecological indices that track marine ecosystem responses to ocean acidification.

(3) Modeling to predict changes in the ocean carbon cycle as a function of carbon dioxide and atmosphere-induced changes in temperature, ocean circulation, biogeochemistry, ecosystem and terrestrial input, and modeling to determine impacts on marine ecosystems and individual marine organisms.

(4) Technology development and standardization of carbonate chemistry measurements on moorings and autonomous floats.

(5) Assessment of socioeconomic impacts of ocean acidification and development of adaptation and mitigation strategies to conserve marine organisms and marine ecosystems.

(d) NATIONAL ACADEMY OF SCIENCES EVALUATION.—The Secretary shall enter into an agreement with the National Academy of Sciences to review the plan.

(e) PUBLIC PARTICIPATION.—In developing the plan, the Subcommittee shall consult with representatives of academic, State, industry and environmental groups. Not later than 90 days before the plan, or any revision thereof, is submitted to the Congress, the plan shall be published in the Federal Register for a public comment period of not less than 60 days.

SEC. 6. NOAA OCEAN ACIDIFICATION ACTIVITIES.

The Secretary shall conduct research and monitoring activities on ocean acidification within the National Oceanic and Atmospheric Administration consistent with the strategic research plan developed by the Subcommittee under section 5 that—

(1) includes—

(A) interdisciplinary research among the ocean and atmospheric sciences, and coordinated research and activities to improve understanding of ocean acidification;

(B) the establishment of a long-term monitoring program of ocean acidification utilizing existing global and national ocean observing assets, and adding instrumentation and sampling stations as appropriate to the aims of the research program;

(C) research to identify and develop adaptation strategies and techniques for effectively conserving marine ecosystems as they cope with increased ocean acidification;

(D) as an integral part of the research programs described in this Act, educational opportunities that encourage an interdisciplinary and international approach to exploring the impacts of ocean acidification;

(E) as an integral part of the research programs described in this Act, national public outreach activities to improve the understanding of current scientific knowledge of ocean acidification and its impacts on marine resources; and

(F) coordination of ocean acidification monitoring and impacts research with other appropriate international ocean science bodies such as the International Oceanographic Commission, the International Council for the Exploration of the Sea, the North Pacific Marine Science Organization, and others;

(2) provides grants for critical research projects that explore the effects of ocean acidification on ecosystems and the socioeconomic impacts of increased ocean acidification that are relevant to the goals and priorities of the strategic research plan; and

(3) incorporates a competitive merit-based process for awarding grants that may be conducted jointly with other participating agencies or under the National Oceanographic Partnership Program under section 7901 of title 10, United States Code.

SEC. 7. NSF OCEAN ACIDIFICATION ACTIVITIES.

(a) RESEARCH ACTIVITIES.—The Director of the National Science Foundation shall continue to carry out research activities on ocean acidification which shall support competitive, merit-based, peer-reviewed proposals for research and monitoring of ocean acidification and its impacts, including—

(1) impacts on marine organisms and marine ecosystems;

(2) impacts on ocean, coastal, and estuarine biogeochemistry; and

(3) the development of methodologies and technologies to evaluate ocean acidification and its impacts.

(b) CONSISTENCY.—The research activities shall be consistent with the strategic research plan developed by the Subcommittee under section 5.

(c) COORDINATION.—The Director shall encourage coordination of the Foundation's ocean acidification activities with such activities of other nations and international organizations.

SEC. 8. NASA OCEAN ACIDIFICATION ACTIVITIES.

(a) OCEAN ACIDIFICATION ACTIVITIES.—The Administrator of the National Aeronautics and Space Administration, in coordination with other relevant agencies, shall ensure that space-based monitoring assets are used in as productive a manner as possible for monitoring of ocean acidification and its impacts.

(b) PROGRAM CONSISTENCY.—The Administrator shall ensure that the Agency's research and monitoring activities on ocean acidification are carried out in a manner consistent with the strategic research plan developed by the Subcommittee under section 5.

(c) COORDINATION.—The Administrator shall encourage coordination of the Agency's ocean acidification activities with such activities of other nations and international organizations.

SEC. 9. AUTHORIZATION OF APPROPRIATIONS.

(a) NOAA.—There are authorized to be appropriated to the National Oceanic and Atmospheric Administration to carry out the purposes of this Act—

(1) $8,000,000 for fiscal year 2009;

(2) $12,000,000 for fiscal year 2010;

(3) $15,000,000 for fiscal year 2011; and

(4) $20,000,000 for fiscal year 2012.

(b) NSF.—There are authorized to be appropriated to the National Science Foundation to carry out the purposes of this Act—

(1) $6,000,000 for fiscal year 2009;

(2) $8,000,000 for fiscal year 2010;

(3) $12,000,000 for fiscal year 2011; and

(4) $15,000,000 for fiscal year 2012.

II. PURPOSE OF THE BILL

The purpose of this bill is to establish an interagency committee to develop an ocean acidification research and monitoring plan and establish an ocean acidification program.

III. BACKGROUND AND NEED FOR LEGISLATION

Over the past 200 years, human activities have contributed to increases in atmospheric carbon dioxide and other greenhouse gases. These emissions are altering the Earth's climate and ocean carbon chemistry. Oceans are essential to maintaining a balance in the global carbon cycle by absorbing excess carbon dioxide. Approximately one half of the carbon dioxide released into the atmosphere since the start of the industrial revolution has been absorbed by the oceans, helping to mitigate the effects of global climate change. However, the increase in atmospheric carbon dioxide is causing changes in ocean carbon chemistry and pH. This disruption in ocean carbon chemistry causes the pH to decrease, a phenomenon identified as ocean acidification.

Ocean hydrogen ion concentration (a measure of acidity) has increased 30 percent since pre-industrial times.[1] [2] Studies have also projected that by the end of the century carbon dioxide emission scenarios could result in the lowest levels of ocean pH in 20 million years.[3] The potential impacts of ocean acidification are diverse and far-reaching, and may include adverse impacts on marine ecosystems, food webs for many fish and marine mammals, and the economies of many coastal states that rely upon the seafood industry and coastal and ocean tourism. Increasing acidity and changes in ocean chemistry have been shown to be corrosive to shell-forming plankton, a major food source for baleen whales and commercially important fish species such as salmon, mackerel, herring, cod, and others. Some studies have also suggested that ocean acidification could be detrimental to shellfish including scallops, clams, and lobsters. Evidence indicates that calcification rates will decrease and carbonate dissolution rates will increase for these calcifying organisms leaving them unable to compete ecologically, perhaps even threatening them to the point of extinction.

Shallow water corals will probably face similar threats due to decreased growth rates and increased shell corrosion. Coral comprise some of the richest habitats on earth. According to NOAA, about 4,000 species of fish, including approximately half of all federally-managed fisheries, depend on coral reefs and related habitat for a portion of their life cycles, and they estimate that the value of U.S. fisheries from coral reefs exceeds $100 million. Juvenile fish may face physiological challenges including respiratory stress and acidosis associated with increased ocean acidification. Deep sea corals and other animals are also threatened by changes in ocean chemistry and may find parts of the deep ocean uninhabitable by the end of this century.

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[1] Caldeira, K. and Wickett, ME. Nature, 2003. "Oceanography: Anthropogenic carbon and ocean pH" 2003 Sep 25: 425 (6956):365.

[2] Feely, Sabine et al. 2004. Impact of Anthropogenic CO_2 on the $CaCO_3$ System in the Oceans and The Oceanic Sink for Anthropogenic CO_2. National Oceanic and Atmospheric Administration PMEL, Seattle,WA. Science, 305(5682), 362–366 (2004) and Science, 305(5682), 367–371 (2004).

[3] Ibid.

Ocean acidification is an emerging issue and scientific experts have testified to the need for increased research and monitoring. There is significant uncertainty as to the rate and magnitude of change that will occur in the ocean and as to what the full impacts to marine organisms and ecosystems will be. National investment in a coordinated program of research and monitoring will improve understanding of ecosystem responses, assess the socio-economic impacts due to increasing ocean acidification, and provide marine resource managers the information they need to develop strategies for the protection of critical species, habitats, and ecosystems. The Administration's Joint Subcommittee on Ocean Science and Technology of the National Science and Technology Council highlighted ocean acidification as a research priority in their 2007 report, *Charting the Course for Ocean Science in the United States for the Next Decade: An Ocean Research Priorities Plan and Implementation Strategy.*[4] The report explains that ocean acidification and other physical and biogeochemical changes may irreversibly alter ecosystems. Sustained ocean observations, process and applied research, and modeling are recommended in the report as necessary tools and research to help determine changes over time and to help identify and quantify ecosystem impacts.

IV. HEARING SUMMARY

The Energy and Environment Subcommittee held a hearing in the 110th Congress on June 5, 2008 to hear testimony on H.R. 4174, from the following witnesses:

- Dr. Richard A. Feely, Supervisory Chemical Oceanographer, Pacific Marine Environmental Laboratory, National Oceanic and Atmospheric Administration
- Dr. Joan Kleypas, Scientist, Institute for the Study of Society and Environment, National Center for Atmospheric Research
- Dr. Scott Doney, Senior Scientist, Department of Marine Chemistry and Geochemistry, Woods Hole Oceanographic Institution
- Dr. Ken Caldeira, Scientist, Department of Global Ecology, Carnegie Institution for Science of Washington
- Mr. Brad Warren, Director, Productive Oceans Partnership Program, Sustainable Fisheries Partnership

The hearing focused on the legislation to establish an interagency committee to develop an ocean acidification research and monitoring plan and establish an ocean acidification program within the National Oceanic and Atmospheric Administration (NOAA).

During the hearing, the witnesses discussed the current status of federal research and monitoring activities focused on ocean acidification and its potential impacts on marine organisms and marine ecosystems.

Dr. Feely discussed the quantification of oceanic uptake of carbon dioxide and NOAA's current monitoring program, as well as the major research issues to be addressed including the relationship between the ocean acidification process and carbon cycling proc-

[4] National Science and Technology Council, Joint Subcommittee on Ocean Science and Technology. Charting the Course for Ocean Science in the United States for the Next Decade: An Ocean Research Priorities Plan and Implementation Strategy. January 26, 2007. Washington, DC. *http://ocean.ceq.gov/about/sup_jsost_prioritiesplan.html.*

esses in the ocean. Dr. Kleypas discussed the impacts of ocean acidification on marine life and marine ecosystems, particularly on coral reef ecosystems. Dr. Doney discussed the gaps in our understanding of ocean acidification and the implications of ocean acidification for marine resource management. Dr. Doney also expressed concerns about the definition of ocean acidification used in the legislation. These concerns were echoed by the other scientists on the panel. He suggested the definition in the bill be expanded from simply reduced pH to incorporate the full suite of changes in ocean chemistry arising from increased carbon dioxide. He also discussed current interagency efforts and federal programs addressing ocean acidification. He stressed the redundancy in establishing a new interagency infrastructure and recommended using the existing interagency committees to guide federal program development. This recommendation was echoed by other witnesses on the panel also.

Dr. Caldeira discussed the ongoing changes in the global carbon cycle and its relationship to ocean acidification including the research and modeling efforts needed to better understand ocean acidification and to project its impacts and develop strategies for adaptation and mitigation.

Mr. Warren represented the Sustainable Fisheries Partnership that provides policy and technical guidance to seafood suppliers and producers. The Productive Oceans Partnership Program was formed to address the issue of ocean acidification. Mr. Warren discussed the potential impacts of ocean acidification on the world seafood industry and the steps the Partnership is recommending to deal with the problem of ocean acidification. Mr. Warren expressed concern that funding for ocean acidification work be supported through new funding and not by redirecting funds from other vital NOAA programs.

V. SUMMARY OF COMMITTEE ACTIONS

On November 14, 2007, Representative Tom Allen of Maine, for himself and Representatives Inslee, Gilchrest, Baird, Ehlers, Bordallo, Holt, Olver, Delahunt, Klein of Florida, Ruppersberger and Christensen introduced H.R. 4174, the Federal Ocean Acidification Research and Monitoring Act of 2007, which was referred to the Committee on Science and Technology.

In the 110th Congress, the Subcommittee on Energy and Environment met to consider H.R. 4174 on June 18, 2008, as introduced. Rep. Brian Baird of Washington and Rep. Bob Inglis of South Carolina offered an amendment-in-the-nature-of-a-substitute.

The amendment-in-the-nature-of-a-substitute designates the Joint Subcommittee on Ocean Science and Technology (JSOST) of the National Science and Technology Council as the coordinating body for federal activities on ocean acidification. The amendment directs JSOST to facilitate communication with individuals and non-governmental organizations with interests in marine resources in the development and implementation of the strategic research plan. The amendment also directs JSOST to coordinate U.S. programs on ocean acidification with international partners. The amendment shortens the time to produce the strategic plan to one year and added a requirement for review of the plan by the Na-

tional Academy of Sciences and a requirement to obtain public comments on the plan. The amendment expanded the definition of ocean acidification. The amendment also shortened the authorization period of the bill to four years.

The amendment was adopted by voice vote.

Rep. Baird moved that the Subcommittee favorably report the bill, H.R. 4174, as amended, to the Full Committee on Science and Technology. The motion was agreed to by a voice vote.

The Committee on Science and Technology met on June 25, 2008, to consider H.R. 4174 as reported by the Subcommittee. Rep. Brian Baird of Washington and Rep. Bob Inglis of South Carolina offered a manager's amendment.

The manager's amendment offered by Mr. Baird and Mr. Inglis would amend the Act by altering the purpose of the bill to establish an interagency research and monitoring program, not simply to establish a program at NOAA. The amendment also eliminates the definition of program. The amendment adds two new sections to the legislation to authorize ocean acidification activities at the National Science Foundation and the National Aeronautics and Space Administration. The amendment also makes an adjustment to the reporting requirements of the bill by increasing the time for providing the strategic research and monitoring plan by one year. The amendment requires the strategic research and monitoring plan to be revised every five years. The amendment directs JSOST to establish a single, web-based portal for information on ocean acidification. The bill authorizes funds for NOAA and NSF over a four year period.

The amendment was adopted by voice vote.

Mr. Baird moved that the Committee favorably report the bill, H.R. 4174, to the House, as amended. The motion was agreed to by a voice vote.

VI. SUMMARY OF MAJOR PROVISIONS AS REPORTED

H.R. 4174, the Federal Ocean Acidification Research and Monitoring Act of 2008, as amended, establishes an interagency program to develop and coordinate a comprehensive plan to better understand and address the impacts of ocean acidification, to provide for assessment of ecosystem and socioeconomic impacts of ocean acidification and to provide for research on adaptation strategies to conserve marine ecosystems.

Section 3 of the bill defines ocean acidification, the Secretary as the Secretary of Commerce and the Subcommittee as the Joint Subcommittee on Ocean Science and Technology (JSOST). Section 4 of the bill designates JSOST as the coordinating body for interagency activities on ocean acidification, defines the duties of JSOST, and directs JSOST to provide three reports to Congress including a strategic research plan for the interagency program on ocean acidification. The bill directs JSOST to establish a single, web-based portal for information on ocean acidification. The amendment also requires JSOST to involve the extramural ocean community in the development of the plan, including universities, states, industry and environmental groups. Section 5 of the bill outlines the contents of the strategic research and monitoring plan and the elements of the interagency program on ocean acidification. The bill requires an evaluation of the plan by the National Acad-

emy of Sciences and the plan to be available for public comment. Section 6 requires the Secretary to carry out a number of activities on ocean acidification that are consistent with the strategic plan. The amended bill adds two new sections to the legislation to authorize ocean acidification activities at the National Science Foundation and the National Aeronautics and Space Administration. The bill authorizes funds for NOAA and NSF over a four year period.

VII. SECTION-BY-SECTION ANALYSIS OF THE BILL AS REPORTED

Section 1. Short title and table of contents

Provides the short title of the legislation: The Federal Ocean Acidification Research and Monitoring Act of 2008

Section 2. Findings and purposes

Designates the purposes of the legislation: to provide for development of an interagency monitoring and research plan; establishment of an interagency research and monitoring program on ocean acidification; assessment of the impacts of ocean acidification; and research on adaptation strategies.

Section 3. Definitions

Defines the terms Ocean Acidification, Secretary, and Subcommittee

Section 4. Interagency subcommittee

Designates the existing Joint Subcommittee on Ocean Science and Technology (JSOST) of the National Science and Technology Council as the coordinating body for federal activities on ocean acidification. The section directs JSOST to develop a strategic plan to coordinate federal efforts to understand ocean acidification and its potential impacts on marine ecosystems and to develop adaptive strategies to conserve marine organisms and marine ecosystems. Requires an initial report to Congress within 1 year after enactment and every two years thereafter of the progress of research and monitoring activities and recommendations for addressing impacts of ocean acidification.

Section 5. Strategic research plan

Directs JSOST to develop a strategic research plan for coordinated federal activities within 2 years of enactment. Establishes contents of the plan to be included in the interagency program and requires the plan to include specific activities, goals and priorities for coordinated research over a 10–year period, to outline activities to facilitate international cooperation and outreach and data exchanges with stakeholders. Requires the strategic research plan to be revised and updated every 5 years. Directs JSOST to consider and utilize other relevant reports and studies in developing the research plan, allow a National Academy of Sciences review, and a public comment period.

Section 6. NOAA ocean acidification activities

Directs the Secretary to conduct research and monitoring activities on ocean acidification within NOAA consistent with the stra-

tegic research plan. Requires the agency to provide grants through a competitive, merit-based process that can be done jointly with other participating agencies.

Section 7. NSF ocean acidification Activities

Directs the Director to continue research activities on ocean acidification that support competitive, merit-based, peer-reviewed proposals consistent with the strategic research plan. Also encourages the Director to coordinate activities with international efforts.

Section 8. NASA ocean acidification activities

Directs the Administrator to ensure that space-based monitoring assets are used for monitoring ocean acidification consistent with the strategic research plan. Also encourages the Administration to coordinate activities with international efforts.

Section 9. Authorization of appropriations

Authorizes appropriations to NOAA that escalate each year beginning in fiscal year 2009 at a funding level of $8 million through fiscal year 2012 when the funding level reaches $20 million. Also authorizes appropriations to NSF that escalate each year beginning in fiscal year 2009 at a funding level of $6 million through fiscal year 2012 when the funding level reaches $15 million.

VIII. COMMITTEE VIEWS

H.R. 4174, the Federal Ocean Acidification Research and Monitoring Act of 2008, as amended, will help build a strong federal interagency research and monitoring program on ocean acidification. The Committee believes ocean acidification is a potentially serious problem from both ecological and economic viewpoints. The Committee believes increased federal research, monitoring and assessment of this phenomenon are needed to determine the true scope of this problem and to develop adaptation and mitigation strategies to address negative consequences of ocean acidification.

The Committee believes the existing Joint Subcommittee on Ocean Science and Technology (JSOST) of the National Science and Technology Council should serve as the coordinating body for the federal interagency effort on ocean acidification. JSOST is co-chaired by the National Oceanic and Atmospheric Administration (NOAA), the National Science Foundation (NSF), and the Office of Science and Technology Policy (OSTP). The membership of JSOST includes all federal agencies with expertise and programs in ocean sciences and ocean resource management. JSOST was established to coordinate federal ocean science and technology efforts to improve prediction and forecasting of ocean phenomena in addition to other functions related to developing and applying new knowledge and technology to managing marine resources. The Committee agreed strongly with witnesses who testified at the hearing before the Subcommittee on Energy and Environment that a new interagency structure was not necessary to guide the development of an expanded federal effort on ocean acidification.

The Committee believes the National Oceanic and Atmospheric Administration (NOAA), as a co-chair of the JSOST and as the only co-chair with substantial in-house expertise, programs, and statutory responsibilities for management of ocean and coastal re-

sources, is the Agency best positioned to lead the federal interagency effort on ocean acidification. Although the Committee believes the federal interagency effort should be led by NOAA, it should include participation by National Science Foundation (NSF), the National Aeronautics and Space Administration (NASA), the Department of Energy, the U.S. Geological Survey (USGS), and the other federal agencies that are members of the Joint Subcommittee on Ocean Science and Technology (JSOST). These other participating agencies must be full partners with NOAA in this effort to ensure that we have a comprehensive program of research, monitoring, technology development and assessment. The research and monitoring program led by NOAA will benefit from the additional resources the other participating agencies provide thus supplementing the effort to address the challenge posed by ocean acidification.

The Committee also believes that international cooperation is essential to better understanding ocean acidification and its impacts. The Committee recognizes that oceans are a global resource, and that many other nations are dependent upon the oceans for food and commerce. An internationally coordinated effort to monitor and assess the impacts of ocean acidification on marine resources appears to be the most practical and cost-effective way to expand our knowledge of this phenomenon. The Committee is aware that a number of activities are already underway in partnership with other nations and the Committee strongly encourages all relevant federal agencies to expand these cooperative efforts to leverage the financial, technical, and human resources that are applied to this problem.

The Committee believes that JSOST will be able to complete a draft of the strategic research and monitoring plan very quickly because much of the work toward development of the plan has been completed recently. The Committee expects JSOST to avoid duplication of effort and to expedite the development of the strategic plan required in Section 5 of the bill by utilizing information from the workshop held in 2005 in St. Petersburg, FL[5] and the 2007 planning workshop in La Jolla, CA hosted by the U.S. Ocean Carbon and Biogeochemistry Program of NSF and co-sponsored by NOAA and NASA[6] as well as information emerging from the current project underway by the Ocean Studies Board of the National Academy of Sciences, Processes and Implications of Ocean Acidification. The Committee believes the strategic plan could be completed within a year or less and submitted to the National Academy of Sciences for review. The Committee also encourages JSOST to establish ongoing communications with all members of the community with an interest in ocean and coastal resources including state, territorial, tribal, and local governments; the commercial and recreational fishing communities; the environmental community,

[5] Kleypas, J.A.; R.A. Feely; V.J. Fabry; C. Langdon; C.L. Sabine; and L.L. Robbins. 2006. Impacts of Ocean Acidification on Coral Reefs and Other Marine Calcifiers: A Guide for Future Research. A report from a workshop sponsored by the National Science Foundation, the National Oceanic and Atmospheric Administration, and the U.S. Geological Survey. 89 pp.

[6] Ocean Carbon and Biogeochemistry Scoping Workshop on Ocean Acidification Research. *www.whoi.edu/sites/OceanAcidificationMeeting*; Ocean Carbon and Biogeochemistry program with support from the National Science Foundation, National Oceanic and Atmospheric Administration, NASA, US Geological Survey, and Scripps Institution of Oceanography. 9–11 October 2007.

and any other individual stakeholders or groups to ensure the plan will meet their needs for information on ocean acidification.

The strategic research and monitoring plan mandated by the bill will include plans for providing information to facilitate the development of adaptation and mitigation strategies to conserve marine organisms and ecosystems. The Committee also intends the plan to outline the research necessary to provide information for assessing the potential impacts to marine organisms and ecosystems. The Committee recognizes the research and monitoring necessary to assess impacts is incomplete at this time, and that we do not yet have information that can be used to develop adaptation and mitigation strategies. Therefore, the Committee did not require an assessment to be produced within a defined time period in this bill. The Committee strongly believes the research and monitoring program should be focused on developing the information needed to conduct assessments and to develop adaptation and mitigation strategies. The Committee believes these products will be needed in the future and the stakeholder community anticipates the research and information generated by this program will be of use to them in maintaining the resource base they rely upon.

The Committee recognizes that monitoring is an essential component of a federal ocean acidification program. The Committee encourages participating agencies to utilize existing platforms, surveys, and other monitoring networks to obtain information on ocean acidification as appropriate. The Committee encourages the agencies to develop technologies that can be added onto existing data collection networks when possible. The Committee also encourages NOAA to coordinate with international partners in the development of a global monitoring network.

The Committee did not mandate that NOAA establish a program on ocean acidification in Section 6 of the legislation. However, the Committee did mandate that the Agency conduct a number of specific activities on ocean acidification. The Committee believes the Agency should expand their existing efforts on ocean acidification and has increased the authorization to NOAA for these activities. The Committee recognizes there are many activities being pursued within existing NOAA programs and in different line offices that are necessary to expanding our knowledge of ocean acidification. The Committee asserts that the Agency has the discretion to establish a program on ocean acidification if the Agency determines the formation of a program is an effective mechanism to organize resources to achieve greater progress in understanding, observing, adapting or mitigating the impacts of ocean acidification.

The Committee believes NSF's role in funding extramural basic research is essential to support the participation of the academic research community in ocean acidification monitoring and research and to understand its impacts on marine organisms and marine ecosystems. The Committee recognizes that NSF currently supports individual research projects, workshops and development and deployment of monitoring technologies on ocean acidification. The Committee also understands the funding for work on ocean acidification is distributed among several directorates and programs at NSF. The Committee encourages NSF to coordinate these efforts to facilitate support for the wide range of research needed to better understand and monitor ocean acidification.

The Committee also believes NASA plays an essential role in monitoring ocean acidification and its impacts through their earth sciences program. The use of space-based technologies to monitor impacts of ocean acidification has the potential to enhance the utility of information gathered using ship-based surveys or buoy networks and to provide real-time, global data on ocean phenomena.

The Committee recognizes the ocean community is recommending much higher levels of funding than are authorized in this legislation. The authorization levels included in the bill provide for modest increases in funding for research and monitoring of ocean acidification at NOAA and NSF over the next few years. The Committee believes these funding increases are achievable without taxing other important research, monitoring, or survey work being done by NOAA or other federal agencies. The Committee believes new funding is required to support this work. The Committee has directed JSOST to provide recommendations for funding of activities on ocean acidification at each agency necessary to carry out the work recommended in the strategic plan.

IX. COST ESTIMATE

A cost estimate and comparison prepared by the Director of the Congressional Budget Office under section 402 of the Congressional Budget Act of 1974 has been timely submitted to the Committee on Science and Technology prior to the filing of this report and is included in section XI of this report pursuant to House rule XIII, clause 3(c)(3).

H.R. 4174 does not contain new budget authority, credit authority, or changes in revenues or tax expenditures. Assuming that the sums authorized under the bill are appropriated, H.R. 4174 does authorize additional discretionary spending, as described in the Congressional Budget Office report on the bill, which is contained in section XI of this report.

X. CONGRESSIONAL BUDGET OFFICE COST ESTIMATE

H.R. 4174—FOARAM Act

As ordered reported by the House Committee on Science and Technology on June 25, 2008

Summary: H.R. 4174 would authorize appropriations totaling $96 million over the 2009–2012 period for the National Oceanic and Atmospheric Administration (NOAA) and the National Science Foundation (NSF) to conduct research and monitor ocean acidification. Assuming the appropriation of the specified amounts, CBO estimates that implementing H.R. 4174 would cost $82 million over the 2009–2013 period and $14 million thereafter. Enacting this legislation would not affect direct spending or revenues.

H.R. 4174 contains no intergovernmental or private-sector mandates as defined in the Unfunded Mandates Reform Act (UMRA) and would impose no costs on state, local, or tribal governments.

Estimated cost to the Federal Government: The estimated budgetary impact of H.R. 4174 is shown in the following table. The cost of this legislation falls within budget functions 250 (general science, space, and technology) and 300 (natural resources and environment).

	By fiscal year, in millions of dollars—					
	2009	2010	2011	2012	2013	2009–2013
CHANGES IN SPENDING SUBJECT TO APPROPRIATION						
NOAA Research and Monitoring:						
Authorization Level	8	12	15	20	0	55
Estimated Outlays	5	9	13	17	6	50
NSF Research:						
Authorization Level	6	8	12	15	0	41
Estimated Outlays	1	4	7	10	10	32
Total Proposed Changes:						
Authorization Level	14	20	27	35	0	96
Estimated Outlays	6	13	20	27	16	82

Basis of estimate: H.R. 4174 would authorize appropriations totaling $96 million over the 2009–2012 period for NOAA and NSF to conduct research and public outreach on ocean acidification and its impact on marine resources. Such funding also would be used by NOAA to conduct long-term monitoring. CBO estimates that, under its current authority, NOAA will spend about $5 million for those activities in 2008.

Based on historical spending patterns for research conducted by NOAA and NSF, CBO estimates that implementing H.R. 4174 would cost $82 million over the 2009–2013 period and $14 million thereafter. This estimate assumes that the bill will be enacted by the beginning of 2009 and that the amounts authorized by the bill will be appropriated for each year.

Intergovernmental and private-sector impact: H.R. 4174 contains no intergovernmental or private-sector mandates as defined in UMRA and would impose no costs on state, local, or tribal governments.

Previous CBO estimates: On March 3, 2008, CBO transmitted a cost estimate for S. 1581, the FOARAM Act, as ordered reported by the Senate Committee on Commerce, Science, and Transportation on December 4, 2007. That legislation authorized the appropriation of $4 million more than the amounts authorized by H.R. 4174, resulting in an additional cost of $2 million over the 2009–2013 period, CBO estimates.

Estimate prepared by: Federal Costs: Daniel Hoople; Impact on State, Local, and Tribal Governments: Neil Hood; Impact on the Private Sector: Amy Petz.

Estimate approved by: Theresa Gullo, Deputy Assistant Director for Budget Analysis.

XI. COMPLIANCE WITH PUBLIC LAW 104–4

H.R. 4174 contains no unfunded mandates.

XII. COMMITTEE OVERSIGHT FINDINGS AND RECOMMENDATIONS

The oversight findings and recommendations of the Committee on Science and Technology are reflected in the body of this report.

XIII. STATEMENT ON GENERAL PERFORMANCE GOALS AND OBJECTIVES

Pursuant to clause (3)(c) of House rule XIII, the goal of H.R. 4174 is to establish an interagency committee to develop an ocean acidification research and monitoring plan and establish an ocean acidification program.

XIV. CONSTITUTIONAL AUTHORITY STATEMENT

Article I, section 8 of the Constitution of the United States grants Congress the authority to enact H.R. 4174.

XV. FEDERAL ADVISORY COMMITTEE STATEMENT

H.R. 4174 does not establish nor authorize the establishment of any advisory committee.

XVI. CONGRESSIONAL ACCOUNTABILITY ACT

The Committee finds that H.R. 4174 does not relate to the terms and conditions of employment or access to public services or accommodations within the meaning of section 102(b)(3) of the Congressional Accountability Act (Public Law 104–1).

XVII. EARMARK IDENTIFICATION

H.R. 4174 does not contain any congressional earmarks, limited tax benefits, or limited tariff benefits as defined in clause 9(d), 9(e), or 9(f) of rule XXI.

XIII. STATEMENT ON PREEMPTION OF STATE, LOCAL, OR TRIBAL LAW

This bill is not intended to preempt any state, local, or tribal law.

XIX. CHANGES IN EXISTING LAW MADE BY THE BILL, AS REPORTED

H.R. 4174, as reported, makes no changes in existing law.

XX. COMMITTEE RECOMMENDATIONS

On June 25, 2008, the Committee on Science and Technology favorably reported H.R. 4174, as amended, by a voice vote and recommended its passage by the House of Representatives.

XXI. PROCEEDINGS OF THE MARKUP BY THE SUBCOMMITTEE ON ENERGY AND ENVIRONMENT ON H.R. 4174, THE FEDERAL OCEAN ACIDIFICATION RESEARCH AND MONITORING ACT OF 2007

WEDNESDAY, JUNE 18, 2008

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON ENERGY AND ENVIRONMENT,
COMMITTEE ON SCIENCE,
Washington, DC.

The Subcommittee met, pursuant to call, at 10:05 a.m., in Room 2318 of the Rayburn House Office Building, Hon. Nick Lampson [Chairman of the Subcommittee] presiding.

Chairman LAMPSON. Good morning. This Subcommittee on Energy and Environment will come to order. Pursuant to notice, the Subcommittee on Energy and Environment meets to consider the following measures: H.R. 4174, *Federal Ocean Acidification Research and Monitoring Act of 2007,* H.R. 5618, *National Sea Grant College Program Amendments Act of 2008,* and a bill to establish a research, development, demonstration and commercial application program to promote research of appropriate technologies for heavy-duty plug-in hybrid vehicles and for other purposes.

We will now proceed with the markup. Beginning with the opening statements, I will begin.

Today the Subcommittee will consider three good bills.

The first is H.R. 4174, the *Federal Ocean Acidification Research and Monitoring Act.* This bill establishes an interagency ocean acidification research and monitoring program. H.R. 4174 was introduced by our colleague from Maine, Congressman Tom Allen, and is sponsored by a Member of this Subcommittee, Mr. Baird.

On June 5th we heard from a panel of experts on ocean and atmospheric sciences testify in strong support of this legislation. The bill authorizes the formation of an interagency research and monitoring program to better understand ocean acidification and its potential impacts on marine organisms and marine ecosystems.

The second bill we will is consider is H.R. 5618, the *National Sea Grant College Program Amendments Act.* H.R. 5618 was introduced by Congresswoman Bordallo, Chair of the Committee on Natural Resources, Subcommittee on Fisheries, Wildlife, and Oceans. This bill reauthorizes and amends the *National Sea Grant College Program Act* to implement changes in the program recommended by the National Academies of Science.

The National Sea Grant College Program was last reauthorized in 2002. It is a partnership between states and the Federal Government to promote understanding, conservation, and management of our ocean, coastal, and Great Lakes resources. Sea Grants research, education, and extension programs have been very effective in training future scientists and resource managers, generating information to support sound resource management, and delivering applied research results to the people who rely on our coastal areas and Great Lakes for their livelihoods.

Finally, the Subcommittee will consider draft legislation authored by Mr. Sensenbrenner, Ranking Member of the Investigations and Oversight Subcommittee, to enhance the Department of Energy's research program in heavy-duty hybrid trucks.

Mr. Sensenbrenner does not sit on this subcommittee, and thus will not be joining us today. I understand that the manager's amendment has only one small technical change that needs to be made prior to introduction. This bill addresses a narrow segment of the automobile market with a tremendous potential impact. We heard in a Subcommittee hearing last week from witnesses who described the substantial oil savings and emissions reductions to be had in medium-to-heavy hybrid trucks, as well as the benefit to the whole domestic automotive sector from the invaluable lessons learned in designing and manufacturing these systems.

I believe this is a very important piece of legislation in the large and complex puzzle that is our transportation sector, and I look forward to moving this bill through Committee and on to the Floor for consideration by the House.

I urge the support of all Members of the Subcommittee for the three bills we will consider today. I look forward to working with all of you to further improve these important bills as we move to their consideration by the Full Committee.

[The prepared statement of Chairman Lampson follows:]

PREPARED STATEMENT OF CHAIRMAN NICK LAMPSON

Good morning. Today the Subcommittee will consider three bills. The first is H.R. 4174, the *Federal Ocean Acidification Research and Monitoring Act.*

This bill establishes an interagency ocean acidification research and monitoring program. H.R. 4174 was introduced by our colleague from Maine, Congressman Tom Allen, and is sponsored by a Member of this subcommittee, Mr. Baird.

On June 5th we heard from a panel of experts on ocean and atmospheric sciences testify in strong support of this legislation. The bill authorizes the formation of an interagency research and monitoring program to better understand ocean acidification and its potential impacts on marine organisms and marine ecosystems.

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The National Sea Grant College Program was last reauthorized in 2002. It is a partnership between states and the Federal Government to promote the understanding, conservation, and management of our ocean, coastal, and Great Lakes resources. Sea Grants research, education, and extension programs have been very effective in training future scientists and resource managers, generating information to support sound resource management, and delivering applied research results to the people who rely on our coastal areas and Great Lakes for their livelihoods.

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Mr. Sensenbrenner does not sit on this subcommittee, and thus will not be joining us today. I understand that the manager's amendment has only one small technical change that needs to be made prior to introduction, and that we will take up any additional amendments in a Full Committee markup.

This bill addresses a narrow segment of the automobile market with a tremendous potential impact. We heard in a Subcommittee hearing last week from witnesses who described the substantial oil savings and emissions reductions to be had in medium-to-heavy hybrid trucks, as well as the benefit to the whole domestic automotive sector from the invaluable lessons learned in designing and manufacturing these systems.

I believe this is a very important piece of legislation in the large and complex puzzle that is our transportation sector. I look forward to moving this bill through Committee and on to the Floor for consideration by the House.

I urge the support of all Members of the Subcommittee for the three bills we will consider today. I look forward to working with all of you to further improve these important bills as we move to their consideration by the Full Committee.

Chairman LAMPSON. I now recognize Mr. Inglis to present his opening remarks.

Mr. INGLIS. Thank you, Mr. Chairman, and thank you for holding this markup. Today we will consider three bills before this Subcommittee. H.R. 4174, the *Federal Ocean Acidification Research and Monitoring Act* would organize and coordinate federal agency efforts to address ocean acidification into a comprehensive research, monitoring, and assessment program. Two weeks ago, this subcommittee held a hearing in which we received several recommended changes from the expert panel of witnesses. Representative Baird and I will introduce an amendment that acts upon these recommendations. As we move forward to Full Committee, I hope that we can further improve the international components of this bill and encourage our scientists to work with their colleagues overseas.

Secondly, we will consider H.R. 5618, the *National Sea Grant College Program Amendments Act.* Since its inception in 1966, the National Sea Grant Program has been a successful collaborative effort of the Federal Government, State governments, and universities. Under the program, these groups work together to understand, develop, and conserve our coastal and ocean resources. As we mark up H.R. 5618, our goal should be a reauthorization that equips the Sea Grant Program to continue providing sound science and management products that benefit our coastal regions and conserve our coastal resources.

Finally, we will consider draft legislation introduced by Mr. Sensenbrenner that would steer federal dollars toward research, development, and demonstration in the area of commercial truck hybrid technologies.

Thank you again, Mr. Chairman. I look forward to working with you to advance this legislation.

[The prepared statement of Mr. Inglis follows:]

PREPARED STATEMENT OF REPRESENTATIVE BOB INGLIS

Thank you for holding this markup, Mr. Chairman.

Today we'll consider three bills before this subcommittee. H.R. 4174, the *Federal Ocean Acidification Research and Monitoring Act,* would organize and coordinate federal agency efforts to address ocean acidification into a comprehensive research, monitoring and assessment program. Two weeks ago, this subcommittee held a hearing in which we received several recommended changes from the expert panel

of witnesses. Rep. Baird and I will introduce an amendment that acts upon these recommendations. As we move forward to Full Committee, I hope that we can further improve the international components of this bill and encourage our scientists to work with their colleagues overseas.

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Finally, we will consider draft legislation introduced by Mr. Sensenbrenner that would steer federal dollars toward research, development, and demonstration in the area of commercial truck hybrid technologies.

Thank you again, Mr. Chairman, and I look forward to working with you to advance this legislation.

Chairman LAMPSON. Thank you, Mr. Inglis. Without objection, Members may place additional opening statements in the record at this point.

We will now consider H.R. 4174, the *Federal Ocean Acidification Research and Monitoring Act of 2007.* I mentioned the goals of this legislation in my opening remarks, and I will just again express my support for Congressman Allen's bill.

I now recognize Mr. Inglis for any remarks on the bill.

Mr. INGLIS. I have no further remarks, Mr. Chairman.

Chairman LAMPSON. Does anyone wish to be recognized?

Mr. BAIRD. Mr. Chairman, I have an amendment at the desk. Mr. Chairman——

Chairman LAMPSON. The Clerk will read the amendment.

Mr. BAIRD. Mr. Chairman, I take back what I just said.

Chairman LAMPSON. And I take back my remark. Oh, that's going to be on the record. I ask unanimous consent that the bill is considered as read and open to amendment at any point and that Members proceed with amendments in the order of the roster. Without objection, so ordered.

Now, the first amendment on the roster is an amendment in the nature of a substitute offered by the gentleman from Washington. Mr. Baird, are you ready with your amendment?

Mr. BAIRD. Mr. Chairman, I have an amendment at the desk.

Chairman LAMPSON. The Clerk will read the amendment.

The CLERK. Amendment in the nature of a substitute to H.R. 4174 offered by Mr. Baird of Washington and Mr. Inglis of South Carolina.

Chairman LAMPSON. I ask unanimous consent to dispense with the reading. Without objection, so ordered.

I recognize the gentleman from Washington for five minutes to explain the amendment.

Mr. BAIRD. Mr. Chairman, I thank you for holding this hearing and for moving this important legislation forward. I want to commend Mr. Allen who introduced the bill and the other co-sponsors, Mr. Inslee, Mr. Gilchrest, and Dr. Ehlers for working on the legislation. I also want to give special thanks to our Ranking Member, Mr. Inglis, for helping to craft the particular amendment we're discussing at present.

This amendment incorporates many of the suggestions by the witnesses who appeared at our hearing just two weeks ago. The

changes made by the amendment do not change the policy goals of the legislation. However, I believe they do improve the bill and will help build a strong program to better understand and address the impacts of ocean acidification. We have been engaged in a full, open, and bipartisan process in the development of this amendment. The Committee staff from both sides of the aisle met a couple of days after the hearing to begin collaborative efforts on incorporating the changes that were suggested by the panel of expert witnesses. A draft of the proposed changes was developed and shared last week, and over the last few days, the Committee staff worked together to put the final amendment together. That process has led us here today with what I think is a good start on a bipartisan bill. All of the witnesses at the hearing indicated that it was not necessary to create a new interagency committee as in the original draft of the legislation. For this reason, the amendment strikes the original language in Section 3 that created the new interagency structure and instead designates the existing Joint Subcommittee on Ocean, Science, and Technology, JSOST, of the National Science and Technology Council as the coordinating body for federal programs on ocean acidification. The amendment charges the Subcommittee of JSOST with the development of the research and monitoring plan and oversight of its implementation. This is not a significant departure and intent from the original bill. However, as we learned in the hearing, it is important to ensure that the work being done in this area is made available to stakeholders so that it can be used including in the management of our fisheries and our coastal resources. For this reason, under the amendment, the Subcommittee is responsible for facilitating communication with individuals and non-governmental organizations with an interest in marine resources.

Many of our witnesses also highlighted the importance of international cooperation in the field. As a result, the amendment directs the Subcommittee to coordinate our research and monitoring efforts with those of other nations. Under our amendment, this subcommittee is directed to provide the research and monitoring plan to Congress within 12 months of enactment and to provide an annual update of the program's progress. This is a slightly shorter timeframe than provided for in the original bill. However, it became clear at the hearing that much work has been done toward this end already, so an earlier date will not pose significant problems for JSOST.

During the hearing, witnesses discussed a number of recent workshops and meetings resulting in reports and plans for research on ocean acidification. As we don't want the Subcommittee to duplicate these efforts, our amendment directs the JSOST committee to develop the research plan using available reports, studies, and information that have already identified research and monitoring needed to better understand ocean acidification and its impacts.

Considering that much of this planning has already occurred, the Subcommittee should be able to use this existing information to expedite the planning process. The amendment defines the contents of plans including specific activities that will be part of the federal program and a requirement that it outline the relevant activities of the federal agencies that contribute to the program and identify

the role of each agency in implementing the plan. Our amendment also requires the plan to include at a minimum program elements that reflect a five research and monitoring themes on ocean acidification that have been identified by NOAA in consultation with the external research community. Our amendment also requires the Subcommittee to involve the ocean community in the development of the plan. This includes universities, states, industries, and environmental groups. The importance of involving the outside research committee was particularly emphasized in the hearing.

Finally, to ensure the scientific merit of the plan was reviewed by the National Academies of Science as required with the public comment period of at least 60 days. And I should note also the amendment expands the definition of acidification from simply a reduction of pH levels to include the many changes in chemistry of the ocean that occurred due to chemical inputs from the atmosphere. The amendment shortens the authorization period to four years whereas the original bill had an indefinite authorization.

Again, I want to thank our Ranking Member, Mr. Inglis, for working with us on this amendment, Chairman Lampson for his support. I look forward to continuing to work together to implement the legislation as we move forward. I encourage all our colleagues to support the amendment and yield back the balance of my time.

Chairman LAMPSON. Is there further discussion on the amendment?

Mr. INGLIS. Mr. Chairman?

Chairman LAMPSON. I recognize Mr. Inglis.

Mr. INGLIS. First of all, I would like to thank Chairman Baird for his leadership on this. We are just back from the very interesting trip to the Galapagos Islands where Chairman Baird continued his tutorial for me on ocean acidification. He started it earlier in Australia. He is actually very knowledgeable about these things, and it has helped me to understand how important this issue is because if we open up a hole in the bottom of the food chain because of ocean acidification, we really have quite a challenge for at least a billion humans who rely on the ocean for sustenance. So in addition, we heard from some excellent scientists in the Galapagos that illustrates really what I was talking about in my opening statement. That we want our scientists to be actively engaged with scientists around the world, and that is what we were seeing in the Galapagos with people like Dr. Julian Sachs at the University of Washington, and he was able to help me with the chemical equation actually that explains ocean acidification. But he really got to me, Chairman Baird, when he mentioned the egg in the vinegar, which I think you had already mentioned to me, but finally got through that you put an egg in vinegar and what happens? The shell sort of dissolves. Well, the same thing happens to calcium-based organisms in the ocean if the acidity increases, the pH goes down.

So anyway, this amendment is a helpful effort I think to do exactly what Chairman Baird just mentioned. It designates the Joint Subcommittee for Ocean Science and Technology, or JSOST, as the coordinating body for the Federal Ocean Acidification effort, which seems to be a more efficient way to accomplish the goal. It also re-

quires that JSOST create a strategic plan that lays out the U.S. research agenda for the next 10 years. If you have a plan, then you are likely to get there. If you don't have a plan, then you are likely to meander around. And it includes a National Academies of Science review of the plan, again using the strengths that we have in the academies.

So this substitute will make the underlying bill much better. There is still work to be done, I think, and I look forward to working with Chairman Baird and others as we move forward to the Full Committee markup and I urge my colleagues to support the substitute.

Chairman LAMPSON. Anyone else seek recognition? Are there any amendments to Mr. Baird's amendment? Hearing none, the vote occurs on the amendment in the nature of a substitute. All in favor say aye, those opposed say no. The ayes have it, and the amendment is agreed to.

The vote is on the bill, H.R. 4174, *Federal Ocean Acidification Research and Monitoring Act of 2007,* as amended. All those in favor will say aye, those opposed say no. In the opinion of the Chair, the ayes have it.

I recognize Mr. Baird for a motion.

Mr. BAIRD. Mr. Chair, I move that the Subcommittee favorably report H.R. 4174 as amended to the Full Committee. Furthermore, I move that staff be instructed to prepare the Subcommittee legislative report and make the necessary technical and conforming changes to the bill in accordance with the recommendations of the Subcommittee.

Chairman LAMPSON. The question is on the motion to report the bill favorably. Those in favor of the motion will signify by saying aye, opposed no. The ayes have it. The bill is favorably reported. Without objection, the motion to reconsider is laid upon the table. Subcommittee Members may submit additional or Minority views on the measure.

And I want to thank Members for their attendance. This concludes our Subcommittee markup. We are adjourned.

[Whereupon, at 10:27 a.m., the Subcommittee was adjourned.]

Appendix:

H.R. 4174, Section-by-Section Analysis, Amendment Roster

I

110TH CONGRESS
1ST SESSION

H. R. 4174

To establish an interagency committee to develop an ocean acidification research and monitoring plan and to establish an ocean acidification program within the National Oceanic and Atmospheric Administration.

IN THE HOUSE OF REPRESENTATIVES

NOVEMBER 14, 2007

Mr. ALLEN (for himself, Mr. INSLEE, Mr. GILCHREST, Mr. BAIRD, Mr. EHLERS, Ms. BORDALLO, Mr. HOLT, Mr. OLVER, Mr. DELAHUNT, Mr. KLEIN of Florida, Mr. RUPPERSBERGER, and Mrs. CHRISTENSEN) introduced the following bill; which was referred to the Committee on Science and Technology

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A BILL

To establish an interagency committee to develop an ocean acidification research and monitoring plan and to establish an ocean acidification program within the National Oceanic and Atmospheric Administration.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. SHORT TITLE; TABLE OF CONTENTS.

(a) SHORT TITLE.—This Act may be cited as the "Federal Ocean Acidification Research And Monitoring Act of 2007" or the "FOARAM Act".

(b) TABLE OF CONTENTS.—The table of contents for this Act is as follows:

SEC. 2. FINDINGS AND PURPOSES.

(a) FINDINGS.—The Congress finds the following:

(1) The oceans help mitigate the effects of global warming by absorbing atmospheric carbon dioxide. About a third of anthropogenic carbon dioxide is currently absorbed by the ocean.

(2) The rapid increase in atmospheric carbon dioxide due to human induced carbon dioxide emissions is overwhelming the natural ability of the oceans to cope with this increase.

(3) The emission of carbon dioxide into the atmosphere is changing surface ocean carbon chemistry and lowering the pH. These changes in ocean chemistry are detrimental to organisms including corals, which support one of the richest habitats on Earth, marine shells, and many other organisms that form the base of the food chain for many fish and marine mammals.

(4) The rich biodiversity of marine organisms is an important contribution to the national economy

and the change in ocean chemistry threatens tourism, our fisheries, and marine environmental quality, and could result in significant social and economic costs.

(5) Existing Federal programs support research in related ocean chemistry, but gaps in funding, coordination, and outreach have impeded national progress in addressing ocean acidification.

(6) National investment in a coordinated program of research and monitoring would improve the understanding of ocean acidification effects on whole ecosystems, advance our knowledge of the socioeconomic impacts of increased ocean acidification, and strengthen the ability of marine resource managers to assess and prepare for the harmful impacts of ocean acidification on our marine resources.

(b) PURPOSES.—The purposes of this Act are to provide for—

(1) development and coordination of a comprehensive interagency plan to monitor and conduct research on the processes and consequences of ocean acidification on marine organisms and ecosystems and to establish an ocean acidification program within the National Oceanic and Atmospheric Administration;

(2) assessment and consideration of regional and national ecosystem and socioeconomic impacts of increased ocean acidification, and integration into marine resource decisions; and

(3) research on adaptation strategies and techniques for effectively conserving marine ecosystems as they cope with increased ocean acidification.

SEC. 3. INTERAGENCY COMMITTEE ON OCEAN ACIDIFICATION.

(a) ESTABLISHMENT.—

(1) IN GENERAL.—There is hereby established an Interagency Committee on Ocean Acidification.

(2) MEMBERSHIP.—The Committee shall be comprised of senior representatives from the National Oceanic and Atmospheric Administration, the National Science Foundation, the National Aeronautics and Space Administration, the United States Geological Survey, the United States Fish and Wildlife Service, the Environmental Protection Agency, the Department of Energy, and such other Federal agencies as the Secretary considers appropriate.

(3) CHAIRMAN.—The Committee shall be chaired by the representative from the National Oceanic and Atmospheric Administration. The chairman may create subcommittees chaired by any member

agency of the committee. Working groups may be formed by the full Committee to address issues that may require more specialized expertise than is provided by existing subcommittees, or to receive advice, input, or comments from the academic community and other relevant stakeholders.

(b) PURPOSE.—The Committee shall oversee the planning, establishment, and coordination of a plan designed to improve the understanding of the role of increased ocean acidification on marine ecosystems and to identify and develop through research adaptation strategies and techniques to effectively conserve marine ecosystems as they cope with increased ocean acidification.

(c) REPORTS TO CONGRESS.—

(1) STRATEGIC RESEARCH AND IMPLEMENTATION PLAN.—The Committee shall submit the strategic research and implementation plan established under section 4 to the Committee on Commerce, Science, and Transportation of the Senate and the Committee on Science and Technology of the House of Representatives not later than 18 months after the date of enactment of this Act.

(2) TRIENNIAL REPORT.—Not later than 2 years after the date of the enactment of this Act and every 3 years thereafter, the Committee shall trans-

mit a report to the Committee on Commerce, Science, and Transportation of the Senate and the Committee on Science and Technology of the House of Representatives that includes—

(A) a summary of federally funded ocean acidification research and monitoring activities, including the budget for each of these activities; and

(B) an analysis of the progress made toward achieving the goals and priorities for the interagency research plan developed by the Committee under section 4 and recommendations for future activities, including policy recommendations developed as part of this research.

SEC. 4. STRATEGIC RESEARCH AND IMPLEMENTATION PLAN.

(a) IN GENERAL.—Within 18 months after the date of enactment of this Act, the Committee shall develop a strategic research and implementation plan for coordinated Federal activities. In developing the plan, the Committee shall consider and use reports and studies conducted by Federal agencies and departments, the National Research Council, the Ocean Research and Resources Advisory Panel, the Joint Subcommittee on Ocean, Science,

and Technology and the Climate Change Science Program of the National Science and Technology Council, the Joint Ocean Commission Initiative, and other expert scientific bodies.

(b) SCOPE.—The plan shall—

(1) provide for interdisciplinary research among the ocean sciences, and coordinated research and activities to improve understanding of ocean acidification that will affect marine ecosystems and to assess the potential and realized socioeconomic impact of ocean acidification, including—

(A) effects of atmospheric carbon dioxide on ocean chemistry;

(B) biological impacts of ocean acidification, including research on—

(i) commercially and recreationally important species;

(ii) protected or endangered or threatened species;

(iii) ecologically important calcifiers that lie at the base of the food chain; and

(iv) physiological consequences of ocean acidification for ocean-dwelling organisms;

(C) identification and assessment of ecosystems most at risk from projected changes in ocean chemistry including—

(i) coastal ecosystems, including coral reef ecosystems;

(ii) deep sea coral ecosystems; and

(iii) polar and subpolar ecosystems;

(D) modeling the effects of changing carbon system chemistry, including ecosystem forecasting;

(E) identifying feedback mechanisms resulting from ocean chemistry changes and decreases in calcification rates of organisms;

(F) socioeconomic impacts of ocean acidification; and

(G) identifying interactions between ocean acidification and other oceanic changes associated with climate change, including changes in sea temperature, ocean circulation, terrestrial runoff, and other changes;

(2) establish, for the 10-year period beginning in the year it is submitted, goals, priorities, and guidelines for coordinated research activities that will—

(A) most effectively advance scientific understanding of the characteristics and impacts of ocean acidification;

(B) provide forecasts of ocean acidification and the consequent impacts on marine ecosystems; and

(C) provide research that could serve as a basis for policy decisions to reduce and manage ocean acidification and its environmental impacts;

(3) provide an estimate of Federal funding requirements for research and monitoring activities; and

(4) identify and strengthen relevant programs and activities of the Federal agencies and departments that would contribute to accomplishing the goals of the plan and prevent unnecessary duplication of efforts, including making recommendations for the use of observing systems and technological research and development.

SEC. 5. NOAA OCEAN ACIDIFICATION PROGRAM.

(a) IN GENERAL.—The Secretary shall establish and maintain an ocean acidification program within the National Oceanic and Atmospheric Administration to implement activities consistent with the strategic research and

implementation plan developed by the Committee under section 4 that—

(1) includes—

(A) interdisciplinary research among the ocean and atmospheric sciences, and coordinated research and activities to improve understanding of ocean acidification;

(B) the establishment of a long-term monitoring program of ocean acidification utilizing existing global and national ocean observing assets, and adding instrumentation and sampling stations as appropriate to the aims of the research program;

(C) research to identify and develop adaptation strategies and techniques for effectively conserving marine ecosystems as they cope with increased ocean acidification;

(D) as an integral part of the research programs described in this Act, educational opportunities that encourage an interdisciplinary and international approach to exploring the impacts of ocean acidification;

(E) as an integral part of the research programs described in this Act, national public outreach activities to improve the under-

standing of current scientific knowledge of ocean acidification and its impacts on marine resources; and

(F) coordination of ocean acidification monitoring and impacts research with other appropriate international ocean science bodies such as the International Oceanographic Commission, the International Council for the Exploration of the Sea, the North Pacific Marine Science Organization, and others;

(2) provides grants for critical research projects that explore the effects of ocean acidification on ecosystems and the socioeconomic impacts of increased ocean acidification that are relevant to the goals and priorities of the strategic research plan; and

(3) incorporates a competitive merit-based grant process that may be conducted jointly with other participating agencies or under the National Oceanographic Partnership Program under section 7901 of title 10, United States Code.

(b) ADDITIONAL AUTHORITY.—In conducting the Program, the Secretary may enter into and perform such contracts, leases, grants, or cooperative agreements as may be necessary to carry out the purposes of this Act on such terms as the Secretary deems appropriate.

SEC. 6. DEFINITIONS.

In this Act:

(1) COMMITTEE.—The term ''Committee'' means the Interagency Committee on Ocean Acidification established by section 3(a).

(2) OCEAN ACIDIFICATION.—The term ''ocean acidification'' means the decrease in pH of the Earth's oceans caused by chemical inputs from the atmosphere, including anthropogenic carbon dioxide.

(3) PROGRAM.—The term ''Program'' means the National Oceanic and Atmospheric Administration Ocean Acidification Program established under section 5.

(4) SECRETARY.—The term ''Secretary'' means the Secretary of Commerce, acting through the Administrator of the National Oceanic and Atmospheric Administration.

SEC. 7. AUTHORIZATION OF APPROPRIATIONS.

(a) IN GENERAL.—There are authorized to be appropriated to the National Oceanic and Atmospheric Administration to carry out the purposes of this Act—

(1) $6,000,000 for fiscal year 2009;

(2) $8,000,000 for fiscal year 2010;

(3) $11,000,000 for fiscal year 2011; and

(4) $30,000,000 for fiscal year 2012 and each fiscal year thereafter.

(b) ALLOCATION.—

(1) Of the amounts made available to carry out this Act for a fiscal year, the Secretary shall allocate at least 60 percent to other departments and agencies to carry out the priorities of the plan developed by the Committee.

(2) Of the amounts made available to carry out this Act for any fiscal year, the Secretary, and other departments and agencies to which amounts are allocated under paragraph (1), shall allocate at least 50 percent for competitive grants.

○

SECTION-BY-SECTION ANALYSIS OF
H.R. 4174, THE FEDERAL OCEAN ACIDIFICATION RESEARCH AND MONITORING ACT

Section 1. Short Title and Table of Contents

Provides the short title of the legislation: The Federal Ocean Acidification Research and Monitoring Act of 2007.

Section 2. Findings and Purposes

Designates the purposes of the legislation: to provide for development of an interagency monitoring and research plan; establishment of an ocean acidification program at NOAA; assessment of the impacts of ocean acidification; and research on adaptation strategies.

Section 3. Interagency Committee on Ocean Acidification

Establishes an interagency committee on ocean acidification chaired by NOAA and designates the membership of the committee to include representatives from the National Science Foundation, the National Aeronautics and Space Administration, the U.S. Geological Survey, U.S. Fish and Wildlife Service, the Environmental Protection Agency, the Department of Energy and other Federal agencies. The section directs the committee to oversee the development of a plan to be submitted to Congress to coordinate federal efforts to understand ocean acidification and its potential impacts on marine ecosystems and to develop adaptive strategies to conserve marine organisms and marine ecosystems. Requires a report to Congress within two years of enactment and every three years thereafter of the progress of research and monitoring activities and recommendations for addressing impacts of ocean acidification.

Section 4. Strategic Research and Implementation Plan

Directs the Committee to develop a strategic research and implementation plan for coordinated federal activities within 18 months of enactment. Establishes criteria and topics to be included in the interagency program and requires the plan to include goals, priorities, and guidelines for coordinated research over a 10-year period. Requires the Committee to consider and utilize other relevant reports and studies in developing the research plan.

Section 5. NOAA Ocean Acidification Program

Directs the Secretary to establish an ocean acidification program within NOAA to implement activities consistent with the strategic research and implementation plan. Requires the program to provide grants through a competitive, merit-based process.

Section 6. Definitions

Defines the terms Committee, Ocean Acidification, Program, and Secretary.

Section 7. Authorization of Appropriations

Authorizes appropriations that escalate each year beginning in fiscal year 2009 at a funding level of $6 million through fiscal year 2012 when the funding level reaches $30 million. The authorization is permanent at a level of $30 million thereafter. The section also directs the Secretary to distribute sixty percent of the funds to agencies other than NOAA to carry out the purposes of the Act and directs that at least fifty percent of all funds be used for competitive grants.

COMMITTEE ON SCIENCE AND TECHNOLOGY
SUBCOMMITTEE ON ENERGY AND ENVIRONMENT
SUBCOMMITTEE MARKUP
June 18, 2008

H.R. 4174 – *Federal Ocean Acidification Research and Monitoring Act of 2007*

AMENDMENT ROSTER

No.	Sponsor	Description	Results
1	**Mr. Baird and Mr. Inglis**	Amendment-in-the-nature-of-a-substitute designates the Joint Subcommittee on Ocean Science and Technology (JSOST) of the National Science and Technology Council as the coordinating body for federal programs on ocean acidification. The amendment outlines the duties of the Subcommittee, including the development of a plan within 12 months, international coordination, and facilitating communication with the universities, state, industry and environmental groups. The amendment defines the contents of the strategic research plan and the major program elements for the federal research program. The amendment also expands the definition of ocean acidification and shortens the authorization period to four years.	Agreed to by voice vote.

AMENDMENT IN THE NATURE OF A SUBSTITUTE

TO H.R. 4174

OFFERED BY MR. BAIRD OF WASHINGTON AND

MR. INGLIS OF SOUTH CAROLINA

Strike all after the enacting clause and insert the following:

SECTION 1. SHORT TITLE; TABLE OF CONTENTS.

(a) SHORT TITLE.—This Act may be cited as the "Federal Ocean Acidification Research And Monitoring Act of 2008" or the "FOARAM Act".

(b) TABLE OF CONTENTS.—The table of contents for this Act is as follows:

SEC. 2. FINDINGS AND PURPOSES.

(a) FINDINGS.—The Congress finds the following:

(1) The oceans help mitigate the effects of global warming by absorbing atmospheric carbon dioxide. About a third of anthropogenic carbon dioxide is currently absorbed by the ocean.

(2) The rapid increase in atmospheric carbon dioxide due to human induced carbon dioxide emissions is overwhelming the natural ability of the oceans to cope with this increase.

(3) The emission of carbon dioxide into the atmosphere is changing surface ocean carbon chemistry and lowering the pH. These changes in ocean chemistry are detrimental to organisms including corals, which support one of the richest habitats on Earth, marine shells, and many other organisms that form the base of the food chain for many fish and marine mammals.

(4) The rich biodiversity of marine organisms is an important contribution to the national economy and the change in ocean chemistry threatens tourism, our fisheries, and marine environmental quality, and could result in significant social and economic costs.

(5) Existing Federal programs support research in related ocean chemistry, but gaps in funding, coordination, and outreach have impeded national progress in addressing ocean acidification.

(6) National investment in a coordinated program of research and monitoring would improve the understanding of ocean acidification effects on whole

ecosystems, advance our knowledge of the socio-economic impacts of increased ocean acidification, and strengthen the ability of marine resource managers to assess and prepare for the harmful impacts of ocean acidification on our marine resources.

(b) PURPOSES.—The purposes of this Act are to provide for—

(1) development and coordination of a comprehensive interagency plan to monitor and conduct research on the processes and consequences of ocean acidification on marine organisms and ecosystems and to establish an ocean acidification program within the National Oceanic and Atmospheric Administration;

(2) assessment and consideration of regional and national ecosystem and socioeconomic impacts of increased ocean acidification, and integration into marine resource decisions; and

(3) research on adaptation strategies and techniques for effectively conserving marine ecosystems as they cope with increased ocean acidification.

SEC. 3. DEFINITIONS.

In this Act:

(1) OCEAN ACIDIFICATION.—The term ''ocean acidification'' means the decrease in pH of the

Earth's oceans and changes in ocean chemistry caused by chemical inputs from the atmosphere, including anthropogenic carbon dioxide.

(2) PROGRAM.—The term "Program" means the National Oceanic and Atmospheric Administration Ocean Acidification Program established under section 6.

(3) SECRETARY.—The term "Secretary" means the Secretary of Commerce, acting through the Administrator of the National Oceanic and Atmospheric Administration.

(4) SUBCOMMITTEE.—The term "Subcommittee" means the Joint Subcommittee on Ocean Science and Technology of the National Science and Technology Council.

SEC. 4. INTERAGENCY SUBCOMMITTEE.

(a) DESIGNATION.—The Joint Subcommittee on Ocean Science and Technology of the National Science and Technology Council shall coordinate Federal programs on ocean acidification.

(b) DUTIES.—The Subcommittee shall—

(1) develop the strategic research and monitoring plan to guide Federal research on ocean acidification required under section 5 of this Act and oversee the implementation of the plan;

(2) oversee the development of—

(A) an assessment of the potential impacts of ocean acidification on marine organisms and marine ecosystems; and

(B) adaptation and mitigation strategies to conserve marine organisms and ecosystems exposed to ocean acidification;

(3) facilitate communication and outreach opportunities with nongovernmental organizations and members of the stakeholder community with interests in marine resources; and

(4) coordinate the United States Federal research and monitoring program with research and monitoring programs and scientists from other nations.

(c) REPORTS TO CONGRESS.—

(1) ANNUAL REPORT.—Not later than 1 year after the date of enactment of this Act and every year thereafter, the Subcommittee shall transmit a report to the Committee on Commerce, Science, and Transportation of the Senate and the Committee on Science and Technology of the House of Representatives that includes—

(A) a summary of federally funded ocean acidification research and monitoring activities,

including the budget for each of these activities; and

(B) an analysis of the progress made toward achieving the goals and priorities for the interagency research plan developed by the Subcommittee under section 5.

(2) STRATEGIC RESEARCH PLAN.—Not later than 1 year after the date of enactment of this Act, the Subcommittee shall transmit the strategic research plan developed under section 5 to the Committee on Commerce, Science, and Transportation of the Senate and the Committee on Science and Technology of the House of Representatives.

SEC. 5. STRATEGIC RESEARCH PLAN.

(a) IN GENERAL.—Not later than 1 year after the date of enactment of this Act, the Subcommittee shall develop a strategic plan for Federal research and monitoring on ocean acidification that will provide for an assessment of the impacts of ocean acidification on marine organisms and marine ecosystems and the development of adaptation and mitigation strategies to conserve marine organisms and marine ecosystems. In developing the plan, the Subcommittee shall consider and use information, reports, and studies of ocean acidification that have identified research

and monitoring needed to better understand ocean acidification and its potential impacts.

(b) CONTENTS OF THE PLAN.—The plan shall—

(1) establish, for the 10-year period beginning in the year the plan is submitted, the goals and priorities for Federal research and monitoring which will—

(A) advance understanding of ocean acidification and its physical, chemical, and biological impacts on marine organisms and marine ecosystems;

(B) improve the ability to assess the socioeconomic impacts of ocean acidification; and

(C) provide information for the development of adaptation and mitigation strategies to conserve marine organisms and marine ecosystems;

(2) describe specific activities, including—

(A) efforts to determine user needs;

(B) research activities;

(C) monitoring activities;

(D) technology and methods development;

(E) data collection;

(F) database development;

(G) modeling activities;

(H) assessment of ocean acidification impacts; and

(I) participation in international research efforts;

(3) identify relevant programs and activities of the Federal agencies that contribute to the Program directly and indirectly and set forth the role of each Federal agency in implementing the plan;

(4) consider and utilize, as appropriate, reports and studies conducted by Federal agencies, the National Research Council, or other entities;

(5) make recommendations for the coordination of the ocean acidification research and monitoring activities of the United States with such activities of other nations and international organizations;

(6) detail budget requirements for Federal ocean acidification research and monitoring and assessment activities to be conducted under the plan;

(7) identify the monitoring systems and sampling programs currently employed in collecting data relevant to ocean acidification and prioritize additional monitoring systems that may be needed to ensure adequate data collection and monitoring of ocean acidification and its impacts; and

(8) describe specific activities designed to facilitate outreach and data and information exchange with stakeholder communities.

(c) PROGRAM ELEMENTS.—The plan shall include at a minimum the following program elements:

(1) Monitoring of ocean chemistry and biological impacts associated with ocean acidification at selected coastal and open-ocean monitoring stations, including satellite-based monitoring to characterize—

(A) marine ecosystems;

(B) changes in marine productivity; and

(C) changes in surface ocean chemistry.

(2) Research to understand the species specific physiological response of marine organisms to ocean acidification and to develop environmental and ecological indices that track marine ecosystem responses to ocean acidification.

(3) Modeling to predict changes in the ocean carbon cycle as a function of carbon dioxide and climate-induced changes in temperature, ocean circulation, biogeochemistry, ecosystem and terrestrial input, and modeling to determine impacts on marine ecosystems and individual marine organisms.

(4) Technology development and standardization of carbonate chemistry measurements on moorings and autonomous floats.

(5) Assessment of socioeconomic impacts of ocean acidification and development of adaptation and mitigation strategies to conserve marine organisms and marine ecosystems.

(d) NATIONAL ACADEMY OF SCIENCES EVALUATION.—The Secretary shall enter into an agreement with the National Academy of Sciences to review the plan.

(e) PUBLIC PARTICIPATION.—In developing the plan, the Subcommittee shall consult with representatives of academic, State, industry and environmental groups. Not later than 90 days before the plan, or any revision thereof, is submitted to the Congress, the plan shall be published in the Federal Register for a public comment period of not less than 60 days.

SEC. 6. NOAA OCEAN ACIDIFICATION PROGRAM.

The Secretary shall establish and maintain an ocean acidification program within the National Oceanic and Atmospheric Administration to implement activities consistent with the strategic research plan developed by the Subcommittee under section 5 that—

(1) includes—

(A) interdisciplinary research among the ocean and atmospheric sciences, and coordinated research and activities to improve understanding of ocean acidification;

(B) the establishment of a long-term monitoring program of ocean acidification utilizing existing global and national ocean observing assets, and adding instrumentation and sampling stations as appropriate to the aims of the research program;

(C) research to identify and develop adaptation strategies and techniques for effectively conserving marine ecosystems as they cope with increased ocean acidification;

(D) as an integral part of the research programs described in this Act, educational opportunities that encourage an interdisciplinary and international approach to exploring the impacts of ocean acidification;

(E) as an integral part of the research programs described in this Act, national public outreach activities to improve the understanding of current scientific knowledge of ocean acidification and its impacts on marine resources; and

(F) coordination of ocean acidification monitoring and impacts research with other appropriate international ocean science bodies such as the International Oceanographic Commission, the International Council for the Exploration of the Sea, the North Pacific Marine Science Organization, and others;

(2) provides grants for critical research projects that explore the effects of ocean acidification on ecosystems and the socioeconomic impacts of increased ocean acidification that are relevant to the goals and priorities of the strategic research plan; and

(3) incorporates a competitive merit-based grant process that may be conducted jointly with other participating agencies or under the National Oceanographic Partnership Program under section 7901 of title 10, United States Code.

SEC. 7. AUTHORIZATION OF APPROPRIATIONS.

There are authorized to be appropriated to the National Oceanic and Atmospheric Administration to carry out the purposes of this Act—

(1) $6,000,000 for fiscal year 2009;

(2) $8,000,000 for fiscal year 2010;

(3) $11,000,000 for fiscal year 2011; and

(4) $30,000,000 for fiscal year 2012.

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XXII. PROCEEDINGS OF THE FULL COMMITTEE MARKUP ON H.R. 4174, FEDERAL OCEAN ACIDIFICATION RESEARCH AND MONITORING ACT OF 2008

WEDNESDAY, JUNE 25, 2008

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE,
Washington, DC.

The Committee met, pursuant to call, at 11:02 a.m., in Room 2318 of the Rayburn House Office Building, Hon. Bart Gordon [Chairman of the Committee] presiding.

Chairman GORDON. This committee will come to order. The first order of business is to introduce our new Member, Mr. Carson, to serve on the Committee of Science and Technology. We currently have two open Subcommittee spots, on Research and Science Education Subcommittee and Investigations and Oversight Subcommittee.

I would like to ask unanimous consent that Mr. Carson be elected to those Subcommittees.

Without objection, so ordered. Congratulations, and welcome to the Committee, Mr. Carson. I know you will be a great addition.

We will now proceed with the markup. Today we will be marking up two important bills. The first bill we will consider is H.R. 5618, the *National Sea Grant College Program Amendments Act,* and H.R. 5618 was introduced by Delegate Bordallo, Chair of the Subcommittee on Fisheries, Wildlife, and Oceans of the Natural Resources Committee.

Our committee shares jurisdiction over the Sea Grant College Program with the Resources Committee. Our staff has been working closely with them.

This bill reauthorizes and amends the *National Sea Grant College Program Act of 2002,* to implement changes recommended by the National Academies of Science.

The bill increase the interaction between the National Sea Grant Office and the individual programs, improve the programmatic performance reviews, and strengthens strategic planning for the program.

This program, created nearly 40 years ago, has matured into a state-Federal Government partnership to improve the conservation, management, and utilization of our oceans, coastal, and Great Lakes resources.

The research, education, and extension programs of Sea Grants have been very effective in training future scientists and resource

managers, providing education to the general public, generating information to support sound resource management, and delivering applied research results to the people who rely on our coastal areas and the Great Lakes for their livelihoods.

Next, we will take up H.R. 4174, the *Federal Ocean Acidification Research and Monitoring Act,* which was introduced by our colleague from Maine, Congressman Tom Allen, and co-sponsored by Dr. Baird and Dr. Ehlers.

This committee has continued to be a leader in the discussion of climate change and its consequences. Ocean Acidification is yet another phenomenon caused by the increase in atmospheric carbon dioxide, and it poses a significant threat to marine organisms and marine ecosystems.

Earlier this month the Energy and Environmental Subcommittee heard from a distinguished panel of ocean and atmospheric scientists who testified in strong support of this legislation.

These witnesses provided a number of recommendations to improve the bill. The staff exemplified bipartisan cooperation by working together to craft an amendment to the bill in the last week's Subcommittee markup to incorporate the recommendations of the witnesses.

The bipartisan effort continued and is reflected in a final agreement that will be offered today.

I strongly support each of these bills and look forward to working with my colleagues on the Committee to advance this important legislation.

I now recognize Mr. Hall to present his opening remarks.

Mr. HALL. Thank you, Mr. Chairman. I am pleased that the Committee is marking up these bills. Each of them addresses issues that are certainly of national importance.

Mr. Chairman, the Committee's work on the National Sea Grant College Program amendments continues a tradition of ensuring the continuation of programs that produce sound science. H.R. 5618 reauthorizes a program that brings local, State, and federal resources together to do research on issues that are of great importance today. This bill also encourages regional collaboration on research projects, recognizing that problems do not stop at the state border.

Additionally, H.R. 4174 organizes the Federal Government's approach to research and monitoring of ocean acidification. Oceans are a valuable resource, essential to our collective well-being. Although the government is conducting some research and monitoring of ocean acidification, it is still done in a very ad hoc manner; most of the time as part of another project. Due to the potential impacts of acidification of the ocean, this phenomenon requires a very comprehensive federal plan that will produce the sound science upon which we can make informed decisions on how to mitigate and how to adapt to it.

Mr. Chairman, I would like to thank you and your staff for working with us on these bills today. I yield back the balance of my time, sir.

[The prepared statement of Mr. Hall follows:]

PREPARED STATEMENT OF REPRESENTATIVE RALPH M. HALL

Thank you, Mr. Chairman. I am pleased that this committee is marking up these bills today. Each of them addresses issues that are of national importance.

Mr. Chairman, the Committee's work on the National Sea Grant College Program Amendments continues its tradition of ensuring the continuation of programs that produce sound science. H.R. 5618, reauthorizes a program that brings local, State and federal resources together to do research on issues that are important today. This bill also encourages regional collaboration on research projects, recognizing that problems do not stop at the state border.

Additionally, H.R. 4174 organizes the Federal Government's approach to research and monitoring of ocean acidification. Oceans are invaluable resources, essential to our collective well-being. Although the government is conducting some research and monitoring of ocean acidification, it is being done in a very ad hoc manner—most of the time as part of another project. Due to the potential impacts of ocean acidification, this phenomenon requires a comprehensive federal plan that will produce the sound science upon which we can make informed decisions on how to mitigate and adapt to it.

Mr. Chairman, I would like to thank you and your staff for working with us on these bills before us today.

I yield back the balance of my time.

Chairman GORDON. Without objection Members may place statements in the record at this point.

[The prepared statement of Mr. Mitchell follows:]

PREPARED STATEMENT OF REPRESENTATIVE HARRY E. MITCHELL

Thank you, Mr. Chairman.

Today we will mark up two important bills, H.R. 4174, the *Federal Ocean Acidification Research and Monitoring Act,* and H.R. 5618, the *National Sea Grant College Program Amendments Act.*

The Sea Grant Colleges sponsor a number of vital marine science research, education, training, and technical assistance programs to promote the understanding and utilization of ocean, coastal, and Great Lakes resources.

Today we will consider amendments to H.R. 5618 that will encourage the National Sea Grant College Program to explore methods for producing offshore energy sources such as petroleum, natural gas, geothermal, wind, and ocean thermal resources.

According to the Department of Interior's Minerals Management Service, of all of the gas and oil believed to exist in the Outer Continental Shelf, 82 percent of natural gas and 79 percent of oil is located in areas that are already open to leasing.

However, despite record-high gas prices, oil and gas companies have stockpiled over 10,000 permits for domestic drilling.

I encourage the Sea Grant Colleges to examine methods for energy production in these areas of the Outer Continental Shelf that are already open to leasing.

I urge my colleagues to support both H.R. 4174 and H.R. 5618.

I yield back.

Chairman GORDON. We now will consider H.R. 4174, the *Federal Ocean Acidification Research and Monitoring Act of 2008.* As I mentioned in my opening, Members and staff have worked in a bipartisan way to craft a good piece of legislation on a very important topic, and I urge my colleagues to support this bill.

I now recognize Dr. Gingrey to present any remarks on the bill.

Mr. GINGREY. Thank you, Mr. Chairman.

H.R. 4174, the *Federal Ocean Acidification Research and Monitoring Act of 2008,* organizes federal activities on ocean acidification research.

Our planet's oceans are priceless assets. Not only do they provide economic and employment value to all coastal nations, they contain vast energy and mineral resources, they are essential sources of food, and they are instrumental in the regulation of global temperature and atmospheric carbon concentrations. Oceans absorb carbon dioxide, thereby increasing the acidity of the oceans. Given

the importance of oceans to our collective well-being, this phenomenon must be further monitored and researched so we can make informed decisions on how to mitigate and adapt to it.

Two years ago we were given a blueprint by the United States Commission on Ocean Policy. They gave us a number of recommendations, particularly with respect for the need for sound science and information from which to base effective national ocean policy. I believe this bill is right in line with what they were suggesting.

So, Mr. Chairman, I would like to thank you and your staff and Mr. Baird and his staff for working with us to improve the bill and craft a good policy.

And I yield back the balance of my time.

Chairman GORDON. Thank you, Dr. Gingrey. Does anyone else wish to be recognized?

If not, I ask unanimous consent that the bill is considered as read and open to amendment at any point, and that the members proceed with amendments in the order of the roster.

Without objection, so ordered.

The first amendment on the roster is a manager's amendment offered by the gentleman from Washington, Dr. Baird. Are you ready to proceed with your amendment?

Mr. BAIRD. I am indeed, Mr. Chairman.

Chairman GORDON. The Clerk will report the amendment.

The CLERK. Amendment to H.R. 4174 offered by Mr. Baird of Washington and Mr. Inglis of South Carolina.

Chairman GORDON. The Clerk—I ask unanimous consent to dispense with the reading.

Without objection, so ordered.

I recognize the gentleman for five minutes to explain his amendment.

Mr. BAIRD. I thank the Chair. I want to begin by thanking Mr. Allen, who introduced the bill originally, along with other co-sponsors, Mr. Inslee, Gilchrest, and Dr. Ehlers. I also want to thank Dr. Gingrey for his support today, and I especially want to acknowledge Mr. Inglis, the Ranking Member of the Subcommittee on Energy and Environment, for joining me in offering this amendment and for his dedication to this issue and the broad issue of health of the oceans. It has been a pleasure to travel with him and study this issue together, and I think we have crafted a very good amendment to a very good underlying bill.

Our amendment incorporates additional changes to H.R. 4174, which were suggested after further consultation with the Administration and with the witnesses who appeared at our hearing three weeks ago. I believe the changes improve the bill and will help build a strong federal research program on ocean acidification.

Parenthetically I should note that just last week *Science* magazine had a special article on how ocean issues have been largely neglected in the IPCC process, and there have been several recent top-flight scientific articles on the very issue we are addressing, that of ocean acidification.

I am pleased that we have continued the full open and bipartisan process we began before the Subcommittee markup to develop the amendment being offered today. The Committee staff from both

sides of the aisle have been meeting and working collaboratively to develop the changes proposed in this amendment.

The amendment makes several clarifying changes to language in the bill and a handful of substantive changes. The amendment adds two new sections to the legislation, authorize ocean acidification activities at the National Science Foundation and at the National Aeronautics and Space Administration.

Our witnesses specifically mentioned the importance of having both of these agencies as active participants in any interagency program on ocean acidification. NSF's role in funding extramural basic research is needed to support the contribution of the academic research community in understanding ocean acidification and its impacts on marine, organisms, and ecosystems.

NASA plays an essential role in monitoring acidification and its impacts through its Earth Sciences Program, its current suite of research satellites, and its technology programs to develop advanced space-based monitoring capabilities.

The amendment also makes an adjustment to the reporting requirements of the bill to avoid overburdening the interagency committee with too many reports in a single year. We have increased the time for providing the strategic research and monitoring plan by one year to allow the intra-agency committee time to, interagency committee time to incorporate recommendations from the National Academy of Science's review of the plan.

Our amendment directs the interagency committee to establish a single web-based portal for information on ocean acidification. This will provide a single location for organizing the information generated through this program and will ensure it is made available to the outside community.

The bill authorizes funds for NOAA and NSF over a four-year period. The initial authorization numbers are based on estimates of the current levels of funding for each of these agencies with just modest increases. Combined our figures are far below the $50 million recommended by our witnesses, but we hope they will be adequate to make a significant impact on this important issue.

I believe these are all realistic and achievable budget increases given the urgency and challenge posed by the problem.

Again, I would like to thank Mr. Inglis for working on this amendment. I believe we have a good piece of legislation. I urge my colleagues to support the amendment and the underlying bill, and I yield back the balance of my time.

[The prepared statement of Mr. Baird follows:]

PREPARED STATEMENT OF REPRESENTATIVE BRIAN BAIRD

Mr. Chairman, I have an amendment at the desk.

I want to thank Mr. Allen, who introduced this bill and the other co-sponsors—Mr. Inslee, Mr. Gilchrest, and Dr. Ehlers for working on this important legislation. I also want to thank our Ranking Member, Mr. Inglis, for working with me on this amendment.

This amendment incorporates suggestions by the witnesses who appeared at our hearing two weeks ago.

The changes made by the amendment do not change the policy goals of the legislation. However, I believe they improve the bill and will help to build a strong program to better understand and address the impacts of ocean acidification.

We have been engaged in a full, open, and bipartisan process in the development of this amendment. The Committee staff from both sides of the aisle met a couple of days after the hearing to begin collaborative efforts on incorporating the changes

that were suggested by the panel of expert witnesses. A draft of the proposed changes was developed and shared last week and, over the last couple of days, the Committee staff worked together to put this final amendment together.

That process has led us here today with what I think is a good start on a bipartisan bill.

All of the witnesses at the hearing indicated that it was not necessary to create a new interagency committee. For this reason, the amendment strikes the original language in Section 3 that created the new interagency structure. Instead, the amendment designates the existing Joint Subcommittee on Ocean Science and Technology (JSOST) of the National Science and Technology Council as the coordinating body for federal programs on ocean acidification.

The amendment charges the Subcommittee with the development of the research and monitoring plan and oversight of its implementation. This is not a significant departure from the original bill.

However, as we learned in the hearing, it is important to ensure that the work that is being done in this area is made available to stakeholders so that it can be used, including in the management of our fisheries and coastal resources. For this reason, under the amendment, the Subcommittee is responsible for facilitating communication with individuals and non-governmental organizations with an interest in marine resources.

Many of the witnesses also highlighted the importance of international cooperation in this field. As a result, the amendment directs the Subcommittee to coordinate our research and monitoring efforts with those of other nations.

Under my amendment, the Subcommittee is directed to provide the research and monitoring plan to Congress within 12 months of enactment and to provide an annual update of the program's progress. This is a slightly shorter time frame than provided for in the original bill. It became clear at the hearing that work has been done toward this end already, so an earlier date will not pose significant problems for JSOST.

During the hearing the witnesses discussed a number of recent workshops and meetings that have resulted in reports and plans for research on ocean acidification. We don't want the Subcommittee to duplicate these efforts. As a result, my amendment directs the Subcommittee to develop the research plan using available reports, studies, and information that have already identified research and monitoring needed to better understand ocean acidification and its potential impacts. Considering that much of this planning has already occurred, the Subcommittee should be able to use this existing information to expedite the planning process.

The amendment defines the contents of the plan, including specific activities that will be part of the federal program and a requirement that it outline the relevant activities of the federal agencies that contribute to the program and identify the role of each agency in implementing the plan.

The amendment also requires the plan to include, at a minimum, program elements that reflect the five major research and monitoring themes on ocean acidification that have been identified by NOAA in consultation with the external research community.

The amendment also requires the Subcommittee to involve the ocean community in the development of the plan. This includes universities, states, industry and environmental groups. The importance of involving the outside research community was emphasized in the hearing.

To ensure the scientific merit of the plan, a review by the National Academy of Sciences is required. A public comment period of at least 60 days is also provided.

As recommended by several of our witnesses, the amendment expands the definition of ocean acidification from simply a reduction of pH levels to include the many changes in the chemistry of the ocean that occur due to chemical inputs from the atmosphere.

Finally, the amendment shortens the authorization period to four years. The original bill had an indefinite authorization.

Again, I want to thank our Ranking Member, Mr. Inglis for working with us on this amendment and Chairman Lampson for his support. I look forward to continuing to work together to make further improvements to this legislation as we go forward. We have taken an important first step with this amendment, but we still have some additional work to do to strengthen the federal program on ocean acidification.

I encourage all of my colleagues to support this amendment, and yield back the balance of my time.

Chairman GORDON. Mr. Inglis, would you like to be recognized?

Mr. INGLIS. Yes, Mr. Chairman.

Chairman GORDON. The gentleman is recognized for five minutes.

Mr. INGLIS. Thank you, Mr. Chairman, and first I want to thank Dr. Baird for his expertise in this area. I think he has helped me learn a great deal more than I knew about ocean acidification, and I thank him for that.

And, as he said, in the Energy and Environment Subcommittee hearing on this bill, we received several recommendations for ways to improve the bill. Between that markup and this amendment that is before us now, significant improvements have been made to the bill that will enhance the national and international efforts to study ocean acidification, to monitor, to access it, and to develop technology to address it.

So this amendment would establish an ocean acidification information exchange as Dr. Baird just said, a web portal that would serve as a clearinghouse for all federal research and monitoring information.

The amendment directs the Joint Subcommittee on Ocean Science and Technology, JSOST, to produce an initial report for the appropriate House and Senate committees on ocean acidification activities.

This report will provide Congress with information during the time period that the strategic research plan is being adopted. We expect that initial research on ocean acidification will reveal new avenues for study. This amendment directs JSOST to revise and update the strategic plan every five years in order to account for these changes.

As we heard from the expert witnesses in the Subcommittee hearing, ocean acidification would have a harmful affect on phytoplankton, the organisms at the bottom of the oceanic food chain. This amendment requires research into the impacts on marine food webs from ocean acidification.

Because climate, atmosphere and chemistry directly affect ocean acidification, it is important to maintain a broad research focus across our science agencies. While the underlying bill already directs NOAA to follow the strategic research plan, this amendment would include NSF under that plan and would charge NASA with ensuring that ocean acidification is established as one of the priorities for future Earth observation missions.

Finally, because NSF is being brought under the guidance of the research plan, this amendment authorizes an additional $41 million to fund research activities at that agency. If our goal is to understand the global and national effects and implications of ocean acidification, it is vital that our scientists have an adequate amount of funding to ensure quality research in this area.

Thank you, Mr. Chairman, and I thank, again, Dr. Baird for his work on this legislation. I support the amendment and urge its passage.

Chairman GORDON. Thank you, Mr. Inglis, and let me say it really is nice to see the really synergy of the work together. I think the, you know, there is a mutual respect, there is an interest and an understanding of your issues, and it just, you know, it really does make for good legislation, and it is fun to watch.

Mr. BAIRD. Mr. Chair, if I may interject on that. In part I will say that is because we have had some outstanding opportunities to travel together to places where the world's leading experts on this issue have educated us, and that opportunity to spend time together, one another as members with topflight scientists is absolutely invaluable and figured heavily in our work on this very legislation.

And we are grateful for your support of that.

Chairman GORDON. Certainly. Okay.

If there is no further discussion on the amendment, then the vote occurs on the amendment. All in favor, say aye. Opposed, no. The ayes have it, and the amendment is agreed to.

Are there other amendments? If no, then the vote is on the bill, H.R. 4174, as amended. All those in favor, say aye. All those opposed, no. In the opinion of the Chair the ayes have it.

I recognize Mr. Baird for a motion.

Mr. BAIRD. Mr. Chairman, I would move that the Committee favorably report H.R. 4174 as amended to the House with the recommendation that the bill do pass. Furthermore, I move that staff be instructed to prepare the legislative report and make necessary technical and conforming changes and that the Chairman take all necessary steps to bring the bill before the House for consideration.

Chairman GORDON. The question is on the motion to report the bill favorably. Those in favor of the motion will signify by saying aye. Opposed, no. The ayes have it, and the bill is favorably reported.

Without objection, the motion to reconsider is laid upon the table. Members will have two subsequent calendar days in which to submit supplemental, Minority, or additional views on the measure, ending Monday, June the 30th, at 9:00 a.m.

I move pursuant to Clause one of Rule 22 of the Rules of the House of Representatives that the Committee authorize the Chairman to offer such motions as may be necessary in the House to adopt and pass H.R. 4174, the *Federal Ocean Acidification Research and Monitoring Act for 2008,* as amended.

Without objection, so ordered.

I want to thank Members for their attendance, and we will see you next Wednesday probably.

[Whereupon, at 1:33 p.m., the Committee was adjourned.]

Appendix:

H.R. 4174 as amended, Amendment Roster

H.R. 4174, AS AMENDED BY THE SUBCOMMITTEE ON ENERGY AND ENVIRONMENT

June 18, 2008

Strike all after the enacting clause and insert the following:

SECTION 1. SHORT TITLE; TABLE OF CONTENTS.

(a) SHORT TITLE.—This Act may be cited as the "Federal Ocean Acidification Research And Monitoring Act of 2008" or the "FOARAM Act".

(b) TABLE OF CONTENTS.—The table of contents for this Act is as follows:

SEC. 2. FINDINGS AND PURPOSES.

(a) FINDINGS.—The Congress finds the following:

(1) The oceans help mitigate the effects of global warming by absorbing atmospheric carbon dioxide. About a third of anthropogenic carbon dioxide is currently absorbed by the ocean.

(2) The rapid increase in atmospheric carbon dioxide due to human induced carbon dioxide emis-

sions is overwhelming the natural ability of the oceans to cope with this increase.

(3) The emission of carbon dioxide into the atmosphere is changing surface ocean carbon chemistry and lowering the pH. These changes in ocean chemistry are detrimental to organisms including corals, which support one of the richest habitats on Earth, marine shells, and many other organisms that form the base of the food chain for many fish and marine mammals.

(4) The rich biodiversity of marine organisms is an important contribution to the national economy and the change in ocean chemistry threatens tourism, our fisheries, and marine environmental quality, and could result in significant social and economic costs.

(5) Existing Federal programs support research in related ocean chemistry, but gaps in funding, coordination, and outreach have impeded national progress in addressing ocean acidification.

(6) National investment in a coordinated program of research and monitoring would improve the understanding of ocean acidification effects on whole ecosystems, advance our knowledge of the socio-economic impacts of increased ocean acidification,

and strengthen the ability of marine resource managers to assess and prepare for the harmful impacts of ocean acidification on our marine resources.

(b) PURPOSES.—The purposes of this Act are to provide for—

(1) development and coordination of a comprehensive interagency plan to monitor and conduct research on the processes and consequences of ocean acidification on marine organisms and ecosystems and to establish an ocean acidification program within the National Oceanic and Atmospheric Administration;

(2) assessment and consideration of regional and national ecosystem and socioeconomic impacts of increased ocean acidification, and integration into marine resource decisions; and

(3) research on adaptation strategies and techniques for effectively conserving marine ecosystems as they cope with increased ocean acidification.

SEC. 3. DEFINITIONS.

In this Act:

(1) OCEAN ACIDIFICATION.—The term ''ocean acidification'' means the decrease in pH of the Earth's oceans and changes in ocean chemistry

caused by chemical inputs from the atmosphere, including anthropogenic carbon dioxide.

(2) PROGRAM.—The term ''Program'' means the National Oceanic and Atmospheric Administration Ocean Acidification Program established under section 6.

(3) SECRETARY.—The term ''Secretary'' means the Secretary of Commerce, acting through the Administrator of the National Oceanic and Atmospheric Administration.

(4) SUBCOMMITTEE.—The term ''Subcommittee'' means the Joint Subcommittee on Ocean Science and Technology of the National Science and Technology Council.

SEC. 4. INTERAGENCY SUBCOMMITTEE.

(a) DESIGNATION.—The Joint Subcommittee on Ocean Science and Technology of the National Science and Technology Council shall coordinate Federal programs on ocean acidification.

(b) DUTIES.—The Subcommittee shall—

(1) develop the strategic research and monitoring plan to guide Federal research on ocean acidification required under section 5 of this Act and oversee the implementation of the plan;

(2) oversee the development of—

(A) an assessment of the potential impacts of ocean acidification on marine organisms and marine ecosystems; and

(B) adaptation and mitigation strategies to conserve marine organisms and ecosystems exposed to ocean acidification;

(3) facilitate communication and outreach opportunities with nongovernmental organizations and members of the stakeholder community with interests in marine resources; and

(4) coordinate the United States Federal research and monitoring program with research and monitoring programs and scientists from other nations.

(c) REPORTS TO CONGRESS.—

(1) ANNUAL REPORT.—Not later than 1 year after the date of enactment of this Act and every year thereafter, the Subcommittee shall transmit a report to the Committee on Commerce, Science, and Transportation of the Senate and the Committee on Science and Technology of the House of Representatives that includes—

(A) a summary of federally funded ocean acidification research and monitoring activities,

including the budget for each of these activities; and

(B) an analysis of the progress made toward achieving the goals and priorities for the interagency research plan developed by the Subcommittee under section 5.

(2) STRATEGIC RESEARCH PLAN.—Not later than 1 year after the date of enactment of this Act, the Subcommittee shall transmit the strategic research plan developed under section 5 to the Committee on Commerce, Science, and Transportation of the Senate and the Committee on Science and Technology of the House of Representatives.

SEC. 5. STRATEGIC RESEARCH PLAN.

(a) IN GENERAL.—Not later than 1 year after the date of enactment of this Act, the Subcommittee shall develop a strategic plan for Federal research and monitoring on ocean acidification that will provide for an assessment of the impacts of ocean acidification on marine organisms and marine ecosystems and the development of adaptation and mitigation strategies to conserve marine organisms and marine ecosystems. In developing the plan, the Subcommittee shall consider and use information, reports, and studies of ocean acidification that have identified research

and monitoring needed to better understand ocean acidification and its potential impacts.

(b) CONTENTS OF THE PLAN.—The plan shall—

(1) establish, for the 10-year period beginning in the year the plan is submitted, the goals and priorities for Federal research and monitoring which will—

(A) advance understanding of ocean acidification and its physical, chemical, and biological impacts on marine organisms and marine ecosystems;

(B) improve the ability to assess the socioeconomic impacts of ocean acidification; and

(C) provide information for the development of adaptation and mitigation strategies to conserve marine organisms and marine ecosystems;

(2) describe specific activities, including—

(A) efforts to determine user needs;

(B) research activities;

(C) monitoring activities;

(D) technology and methods development;

(E) data collection;

(F) database development;

(G) modeling activities;

(H) assessment of ocean acidification impacts; and

(I) participation in international research efforts;

(3) identify relevant programs and activities of the Federal agencies that contribute to the Program directly and indirectly and set forth the role of each Federal agency in implementing the plan;

(4) consider and utilize, as appropriate, reports and studies conducted by Federal agencies, the National Research Council, or other entities;

(5) make recommendations for the coordination of the ocean acidification research and monitoring activities of the United States with such activities of other nations and international organizations;

(6) detail budget requirements for Federal ocean acidification research and monitoring and assessment activities to be conducted under the plan;

(7) identify the monitoring systems and sampling programs currently employed in collecting data relevant to ocean acidification and prioritize additional monitoring systems that may be needed to ensure adequate data collection and monitoring of ocean acidification and its impacts; and

(8) describe specific activities designed to facilitate outreach and data and information exchange with stakeholder communities.

(c) PROGRAM ELEMENTS.—The plan shall include at a minimum the following program elements:

(1) Monitoring of ocean chemistry and biological impacts associated with ocean acidification at selected coastal and open-ocean monitoring stations, including satellite-based monitoring to characterize—

(A) marine ecosystems;

(B) changes in marine productivity; and

(C) changes in surface ocean chemistry.

(2) Research to understand the species specific physiological response of marine organisms to ocean acidification and to develop environmental and ecological indices that track marine ecosystem responses to ocean acidification.

(3) Modeling to predict changes in the ocean carbon cycle as a function of carbon dioxide and climate-induced changes in temperature, ocean circulation, biogeochemistry, ecosystem and terrestrial input, and modeling to determine impacts on marine ecosystems and individual marine organisms.

(4) Technology development and standardization of carbonate chemistry measurements on moorings and autonomous floats.

(5) Assessment of socioeconomic impacts of ocean acidification and development of adaptation and mitigation strategies to conserve marine organisms and marine ecosystems.

(d) NATIONAL ACADEMY OF SCIENCES EVALUATION.—The Secretary shall enter into an agreement with the National Academy of Sciences to review the plan.

(e) PUBLIC PARTICIPATION.—In developing the plan, the Subcommittee shall consult with representatives of academic, State, industry and environmental groups. Not later than 90 days before the plan, or any revision thereof, is submitted to the Congress, the plan shall be published in the Federal Register for a public comment period of not less than 60 days.

SEC. 6. NOAA OCEAN ACIDIFICATION PROGRAM.

The Secretary shall establish and maintain an ocean acidification program within the National Oceanic and Atmospheric Administration to implement activities consistent with the strategic research plan developed by the Subcommittee under section 5 that—

(1) includes—

(A) interdisciplinary research among the ocean and atmospheric sciences, and coordinated research and activities to improve understanding of ocean acidification;

(B) the establishment of a long-term monitoring program of ocean acidification utilizing existing global and national ocean observing assets, and adding instrumentation and sampling stations as appropriate to the aims of the research program;

(C) research to identify and develop adaptation strategies and techniques for effectively conserving marine ecosystems as they cope with increased ocean acidification;

(D) as an integral part of the research programs described in this Act, educational opportunities that encourage an interdisciplinary and international approach to exploring the impacts of ocean acidification;

(E) as an integral part of the research programs described in this Act, national public outreach activities to improve the understanding of current scientific knowledge of ocean acidification and its impacts on marine resources; and

(F) coordination of ocean acidification monitoring and impacts research with other appropriate international ocean science bodies such as the International Oceanographic Commission, the International Council for the Exploration of the Sea, the North Pacific Marine Science Organization, and others;

(2) provides grants for critical research projects that explore the effects of ocean acidification on ecosystems and the socioeconomic impacts of increased ocean acidification that are relevant to the goals and priorities of the strategic research plan; and

(3) incorporates a competitive merit-based grant process that may be conducted jointly with other participating agencies or under the National Oceanographic Partnership Program under section 7901 of title 10, United States Code.

SEC. 7. AUTHORIZATION OF APPROPRIATIONS.

There are authorized to be appropriated to the National Oceanic and Atmospheric Administration to carry out the purposes of this Act—

(1) $6,000,000 for fiscal year 2009;

(2) $8,000,000 for fiscal year 2010;

(3) $11,000,000 for fiscal year 2011; and

(4) $30,000,000 for fiscal year 2012.

COMMITTEE ON SCIENCE AND TECHNOLOGY
FULL COMMITTEE MARKUP
JUNE 25, 2008

AMENDMENT ROSTER

H.R. 4174, Federal Ocean Acidification Research and Monitoring Act of 2008

No.	Sponsor	Description	Results
1	Mr. Baird and Mr. Inglis	Manager's amendment changes the program to an interagency research and monitoring program; adds two new sections to authorize ocean acidification activities that are ongoing at NSF and NASA; authorizes funds for NOAA and NSF over a four year period; and, makes other minor and technical corrections.	Agreed to by voice vote.

AMENDMENT TO H.R. 4174

OFFERED BY MR. BAIRD OF WASHINGTON AND MR. INGLIS OF SOUTH CAROLINA

Page 1, line 9, through page 2, line 10, amend paragraphs (1) through (3) to read as follows:

(1) The oceans help regulate atmospheric chemistry by acting as the largest sink for carbon dioxide.

(2) The rapid increase in atmospheric carbon dioxide is overwhelming the natural ability of the oceans to absorb this gas.

(3) The influx of carbon dioxide into the atmosphere and the subsequent absorption by the oceans is changing surface ocean carbon chemistry and lowering the pH. These changes in ocean chemistry are detrimental to organisms including corals, which support one of the richest habitats on Earth, marine shellfish, and many other organisms that form the base of the food chain for many fish and marine mammals.

Page 3, lines 4 through 19, amend subsection (b) to read as follows:

(b) PURPOSES.—The purposes of this Act are to provide for—

(1) development and coordination of a comprehensive interagency plan to—

(A) monitor and conduct research on the processes and consequences of ocean acidification on marine organisms and ecosystems; and

(B) establish an interagency research and monitoring program on ocean acidification;

(2) assessment and consideration of regional and national ecosystem and socioeconomic impacts of increased ocean acidification; and

(3) research on adaptation strategies and techniques for effectively conserving marine ecosystems as they cope with increased ocean acidification.

Page 4, line 2, strike "anthropogenic".

Page 4, lines 3 through 6, strike paragraph (2).

Page 4, lines 7 and 11, redesignate paragraphs (3) and (4) as paragraphs (2) and (3), respectively.

Page 4, lines 18 and 19, strike "programs" and insert "activities".

Page 5, line 10, strike "and".

Page 5, line 14, strike the period and insert "; and".

Page 5, after line 14, insert the following new paragraph:

(5) establish or designate an Ocean Acidification Information Exchange to make information on ocean acidification developed through or utilized by the interagency ocean acidification program accessible through electronic means, including information which would be useful to policymakers, researchers, and other stakeholders in mitigating or adapting to the impacts of ocean acidification.

Page 5, after line 15, insert the following new paragraph:

(1) INITIAL REPORT.—Not later than 1 year after the date of enactment of this Act, the Subcommittee shall transmit a report to the Committee on Commerce, Science, and Transportation of the Senate and the Committee on Science and Technology of the House of Representatives that—

(A) includes a summary of federally funded ocean acidification research and monitoring activities, including the budget for each of these activities; and

(B) describes the progress in developing the plan required under section 5 of this Act.

Page 5, line 16, strike "ANNUAL REPORT" and insert "BIENNIAL REPORT".

Page 5, lines 16 through 18, strike "Not later than 1 year after the date of enactment of this Act and every year thereafter" and insert "Not later than 2 years after the delivery of the initial report under paragraph (1) and every 2 years thereafter".

Page 6, line 8, strike "1 year" and insert "2 years".

Page 6, line 13, insert "A revised plan shall be submitted at least once every 5 years thereafter." after "House of Representatives.".

Page 6, line 15, strike "1 year" and insert "2 years".

Page 7, line 2, insert ", and recommendations made by the National Academy of Sciences in the review of the plan required under subsection (d)" after "its potential impacts".

Page 8, line 6, strike "Program" and insert "interagency program".

Page 8, line 16, strike "detail" and insert "outline".

Page 8, line 18, insert "by each agency" after "to be conducted".

Page 9, line 16, insert ", impacts on marine food webs of ocean acidification," after "to ocean acidification".

Page 9, lines 20 and 21, strike "climate-induced" and insert "atmosphere-induced".

Page 10, line 18, strike "**PROGRAM**" and insert "**ACTIVITIES**" (and amend the table of contents accordingly).

Page 10, lines 19, through 21, strike "establish and maintain an ocean acidification program within the National Oceanic and Atmospheric Administration to implement activities" and insert "conduct research and monitoring activities on ocean acidification within the National Oceanic and Atmospheric Administration".

Page 12, line 14, strike "grant process" and insert "process for awarding grants".

Page 12, line 18, through page 13, line 1, strike section 7 and insert the following new sections:

SEC. 7. NSF OCEAN ACIDIFICATION ACTIVITIES.

(a) RESEARCH ACTIVITIES.—The Director of the National Science Foundation shall continue to carry out research activities on ocean acidification which shall support competitive, merit-based, peer-reviewed proposals for re-

search and monitoring of ocean acidification and its impacts, including—

(1) impacts on marine organisms and marine ecosystems;

(2) impacts on ocean, coastal, and estuarine biogeochemistry; and

(3) the development of methodologies and technologies to evaluate ocean acidification and its impacts.

(b) CONSISTENCY.—The research activities shall be consistent with the strategic research plan developed by the Subcommittee under section 5.

(c) COORDINATION.—The Director shall encourage coordination of the Foundation's ocean acidification activities with such activities of other nations and international organizations.

SEC. 8. NASA OCEAN ACIDIFICATION ACTIVITIES.

(a) OCEAN ACIDIFICATION ACTIVITIES.—The Administrator of the National Aeronautics and Space Administration, in coordination with other relevant agencies, shall ensure that space-based monitoring assets are used in as productive a manner as possible for monitoring of ocean acidification and its impacts.

(b) PROGRAM CONSISTENCY.—The Administrator shall ensure that the Agency's research and monitoring

activities on ocean acidification are carried out in a manner consistent with the strategic research plan developed by the Subcommittee under section 5.

(c) COORDINATION.—The Administrator shall encourage coordination of the Agency's ocean acidification activities with such activities of other nations and international organizations.

SEC. 9. AUTHORIZATION OF APPROPRIATIONS.

(a) NOAA.—There are authorized to be appropriated to the National Oceanic and Atmospheric Administration to carry out the purposes of this Act—

(1) $8,000,000 for fiscal year 2009;

(2) $12,000,000 for fiscal year 2010;

(3) $15,000,000 for fiscal year 2011; and

(4) $20,000,000 for fiscal year 2012.

(b) NSF.—There are authorized to be appropriated to the National Science Foundation to carry out the purposes of this Act—

(1) $6,000,000 for fiscal year 2009;

(2) $8,000,000 for fiscal year 2010;

(3) $12,000,000 for fiscal year 2011; and

(4) $15,000,000 for fiscal year 2012.

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XXIII. Exchange of Letters

U.S. House of Representatives
Committee on Natural Resources
Washington, DC 20515

July 7, 2008

The Honorable Bart Gordon
Chairman
Committee on Science and Technology
2320 Rayburn H.O.B.
Washington, D.C. 20515

Dear Mr. Chairman:

Thank you for the opportunity to work with you on H.R. 4174, the Federal Ocean Acidification Research and Monitoring Act of 2008, concerning provisions regarding the establishment and maintenance of an ocean acidification program which are within the jurisdiction of the Committee on Natural Resources.

Because of the continued cooperation and consideration that you have afforded me and my staff in developing these provisions, I will not seek a sequential referral of H.R. 4174. Of course, this waiver is not intended to prejudice any future jurisdictional claims over these provisions or similar language. I also reserve the right to seek to have conferees named from the Committee on Natural Resources on these provisions, and request your support if such a request is made.

Please place this letter into the committee report on H.R. 4174 and into the Congressional Record during consideration of the measure on the House floor.

With warm regards, I am

Sincerely,

NICK J. RAHALL, II
Chairman
Committee on Natural Resources

BART GORDON, TENNESSEE
CHAIRMAN

RALPH M. HALL, TEXAS
RANKING MEMBER

U.S. HOUSE OF REPRESENTATIVES
COMMITTEE ON SCIENCE AND TECHNOLOGY
SUITE 2320 RAYBURN HOUSE OFFICE BUILDING
WASHINGTON, DC 20515–6301
(202) 225–6375
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http://science.house.gov

July 8, 2008

The Honorable Nick J. Rahall, II
Chairman
Committee on Natural Resources
U.S. House of Representatives
1324 Longworth House Office Building
Washington, D.C. 20515

Dear Chairman Rahall:

Thank you for working with me to allow floor consideration of H.R. 4174, the Federal Ocean Acidification Research and Monitoring Act of 2008, to proceed.

I appreciate your willingness to waive your Committee's right to a referral of H.R. 4174, and acknowledge that this waiver does not prejudice any further jurisdictional claims by your Committee over this legislation or similar language. Furthermore, I agree to support your request for appointment of conferees from the Committee on Natural Resources if a conference is held on this matter.

A copy of this letter and your response will be placed in the Committee report on H.R. 4174 and in the Congressional Record during consideration of the bill on the House floor.

I look forward to working with you as we prepare to pass this important legislation.

Sincerely,

BART GORDON
Chairman

cc: The Honorable Ralph M. Hall, Ranking Member
The Honorable John Sullivan, Parliamentarian

H.R. 4174, AS REPORTED BY THE COMMITTEE ON SCIENCE AND TECHNOLOGY

Strike all after the enacting clause and insert the following:

SECTION 1. SHORT TITLE; TABLE OF CONTENTS.

(a) SHORT TITLE.—This Act may be cited as the "Federal Ocean Acidification Research And Monitoring Act of 2008" or the "FOARAM Act".

(b) TABLE OF CONTENTS.—The table of contents for this Act is as follows:

SEC. 2. FINDINGS AND PURPOSES.

(a) FINDINGS.—The Congress finds the following:

(1) The oceans help regulate atmospheric chemistry by acting as the largest sink for carbon dioxide.

(2) The rapid increase in atmospheric carbon dioxide is overwhelming the natural ability of the oceans to absorb this gas.

(3) The influx of carbon dioxide into the atmosphere and the subsequent absorption by the oceans is changing surface ocean carbon chemistry and lowering the pH. These changes in ocean chemistry are detrimental to organisms including corals, which support one of the richest habitats on Earth, marine shellfish, and many other organisms that form the base of the food chain for many fish and marine mammals.

(4) The rich biodiversity of marine organisms is an important contribution to the national economy and the change in ocean chemistry threatens tourism, our fisheries, and marine environmental quality, and could result in significant social and economic costs.

(5) Existing Federal programs support research in related ocean chemistry, but gaps in funding, coordination, and outreach have impeded national progress in addressing ocean acidification.

(6) National investment in a coordinated program of research and monitoring would improve the understanding of ocean acidification effects on whole ecosystems, advance our knowledge of the socioeconomic impacts of increased ocean acidification, and strengthen the ability of marine resource man-

agers to assess and prepare for the harmful impacts of ocean acidification on our marine resources.

(b) PURPOSES.—The purposes of this Act are to provide for—

(1) development and coordination of a comprehensive interagency plan to—

(A) monitor and conduct research on the processes and consequences of ocean acidification on marine organisms and ecosystems; and

(B) establish an interagency research and monitoring program on ocean acidification;

(2) assessment and consideration of regional and national ecosystem and socioeconomic impacts of increased ocean acidification; and

(3) research on adaptation strategies and techniques for effectively conserving marine ecosystems as they cope with increased ocean acidification.

SEC. 3. DEFINITIONS.

In this Act:

(1) OCEAN ACIDIFICATION.—The term ''ocean acidification'' means the decrease in pH of the Earth's oceans and changes in ocean chemistry caused by chemical inputs from the atmosphere, including carbon dioxide.

(2) SECRETARY.—The term "Secretary" means the Secretary of Commerce, acting through the Administrator of the National Oceanic and Atmospheric Administration.

(3) SUBCOMMITTEE.—The term "Subcommittee" means the Joint Subcommittee on Ocean Science and Technology of the National Science and Technology Council.

SEC. 4. INTERAGENCY SUBCOMMITTEE.

(a) DESIGNATION.—The Joint Subcommittee on Ocean Science and Technology of the National Science and Technology Council shall coordinate Federal activities on ocean acidification.

(b) DUTIES.—The Subcommittee shall—

(1) develop the strategic research and monitoring plan to guide Federal research on ocean acidification required under section 5 of this Act and oversee the implementation of the plan;

(2) oversee the development of—

(A) an assessment of the potential impacts of ocean acidification on marine organisms and marine ecosystems; and

(B) adaptation and mitigation strategies to conserve marine organisms and ecosystems exposed to ocean acidification;

(3) facilitate communication and outreach opportunities with nongovernmental organizations and members of the stakeholder community with interests in marine resources;

(4) coordinate the United States Federal research and monitoring program with research and monitoring programs and scientists from other nations; and

(5) establish or designate an Ocean Acidification Information Exchange to make information on ocean acidification developed through or utilized by the interagency ocean acidification program accessible through electronic means, including information which would be useful to policymakers, researchers, and other stakeholders in mitigating or adapting to the impacts of ocean acidification.

(c) REPORTS TO CONGRESS.—

(1) INITIAL REPORT.—Not later than 1 year after the date of enactment of this Act, the Subcommittee shall transmit a report to the Committee on Commerce, Science, and Transportation of the Senate and the Committee on Science and Technology of the House of Representatives that—

(A) includes a summary of federally funded ocean acidification research and monitoring

activities, including the budget for each of these activities; and

(B) describes the progress in developing the plan required under section 5 of this Act.

(2) BIENNIAL REPORT.—Not later than 2 years after the delivery of the initial report under paragraph (1) and every 2 years thereafter, the Subcommittee shall transmit a report to the Committee on Commerce, Science, and Transportation of the Senate and the Committee on Science and Technology of the House of Representatives that includes—

(A) a summary of federally funded ocean acidification research and monitoring activities, including the budget for each of these activities; and

(B) an analysis of the progress made toward achieving the goals and priorities for the interagency research plan developed by the Subcommittee under section 5.

(3) STRATEGIC RESEARCH PLAN.—Not later than 2 years after the date of enactment of this Act, the Subcommittee shall transmit the strategic research plan developed under section 5 to the Committee on Commerce, Science, and Transportation of

the Senate and the Committee on Science and Technology of the House of Representatives. A revised plan shall be submitted at least once every 5 years thereafter.

SEC. 5. STRATEGIC RESEARCH PLAN.

(a) IN GENERAL.—Not later than 2 years after the date of enactment of this Act, the Subcommittee shall develop a strategic plan for Federal research and monitoring on ocean acidification that will provide for an assessment of the impacts of ocean acidification on marine organisms and marine ecosystems and the development of adaptation and mitigation strategies to conserve marine organisms and marine ecosystems. In developing the plan, the Subcommittee shall consider and use information, reports, and studies of ocean acidification that have identified research and monitoring needed to better understand ocean acidification and its potential impacts, and recommendations made by the National Academy of Sciences in the review of the plan required under subsection (d).

(b) CONTENTS OF THE PLAN.—The plan shall—

(1) establish, for the 10-year period beginning in the year the plan is submitted, the goals and priorities for Federal research and monitoring which will—

(A) advance understanding of ocean acidification and its physical, chemical, and biological impacts on marine organisms and marine ecosystems;

(B) improve the ability to assess the socioeconomic impacts of ocean acidification; and

(C) provide information for the development of adaptation and mitigation strategies to conserve marine organisms and marine ecosystems;

(2) describe specific activities, including—

(A) efforts to determine user needs;

(B) research activities;

(C) monitoring activities;

(D) technology and methods development;

(E) data collection;

(F) database development;

(G) modeling activities;

(H) assessment of ocean acidification impacts; and

(I) participation in international research efforts;

(3) identify relevant programs and activities of the Federal agencies that contribute to the interagency program directly and indirectly and set forth

the role of each Federal agency in implementing the plan;

(4) consider and utilize, as appropriate, reports and studies conducted by Federal agencies, the National Research Council, or other entities;

(5) make recommendations for the coordination of the ocean acidification research and monitoring activities of the United States with such activities of other nations and international organizations;

(6) outline budget requirements for Federal ocean acidification research and monitoring and assessment activities to be conducted by each agency under the plan;

(7) identify the monitoring systems and sampling programs currently employed in collecting data relevant to ocean acidification and prioritize additional monitoring systems that may be needed to ensure adequate data collection and monitoring of ocean acidification and its impacts; and

(8) describe specific activities designed to facilitate outreach and data and information exchange with stakeholder communities.

(c) PROGRAM ELEMENTS.—The plan shall include at a minimum the following program elements:

(1) Monitoring of ocean chemistry and biological impacts associated with ocean acidification at selected coastal and open-ocean monitoring stations, including satellite-based monitoring to characterize—

(A) marine ecosystems;

(B) changes in marine productivity; and

(C) changes in surface ocean chemistry.

(2) Research to understand the species specific physiological response of marine organisms to ocean acidification, impacts on marine food webs of ocean acidification, and to develop environmental and ecological indices that track marine ecosystem responses to ocean acidification.

(3) Modeling to predict changes in the ocean carbon cycle as a function of carbon dioxide and atmosphere-induced changes in temperature, ocean circulation, biogeochemistry, ecosystem and terrestrial input, and modeling to determine impacts on marine ecosystems and individual marine organisms.

(4) Technology development and standardization of carbonate chemistry measurements on moorings and autonomous floats.

(5) Assessment of socioeconomic impacts of ocean acidification and development of adaptation

and mitigation strategies to conserve marine organisms and marine ecosystems.

(d) NATIONAL ACADEMY OF SCIENCES EVALUATION.—The Secretary shall enter into an agreement with the National Academy of Sciences to review the plan.

(e) PUBLIC PARTICIPATION.—In developing the plan, the Subcommittee shall consult with representatives of academic, State, industry and environmental groups. Not later than 90 days before the plan, or any revision thereof, is submitted to the Congress, the plan shall be published in the Federal Register for a public comment period of not less than 60 days.

SEC. 6. NOAA OCEAN ACIDIFICATION ACTIVITIES.

The Secretary shall conduct research and monitoring activities on ocean acidification within the National Oceanic and Atmospheric Administration consistent with the strategic research plan developed by the Subcommittee under section 5 that—

(1) includes—

(A) interdisciplinary research among the ocean and atmospheric sciences, and coordinated research and activities to improve understanding of ocean acidification;

(B) the establishment of a long-term monitoring program of ocean acidification utilizing

existing global and national ocean observing assets, and adding instrumentation and sampling stations as appropriate to the aims of the research program;

(C) research to identify and develop adaptation strategies and techniques for effectively conserving marine ecosystems as they cope with increased ocean acidification;

(D) as an integral part of the research programs described in this Act, educational opportunities that encourage an interdisciplinary and international approach to exploring the impacts of ocean acidification;

(E) as an integral part of the research programs described in this Act, national public outreach activities to improve the understanding of current scientific knowledge of ocean acidification and its impacts on marine resources; and

(F) coordination of ocean acidification monitoring and impacts research with other appropriate international ocean science bodies such as the International Oceanographic Commission, the International Council for the Ex-

ploration of the Sea, the North Pacific Marine Science Organization, and others;

(2) provides grants for critical research projects that explore the effects of ocean acidification on ecosystems and the socioeconomic impacts of increased ocean acidification that are relevant to the goals and priorities of the strategic research plan; and

(3) incorporates a competitive merit-based process for awarding grants that may be conducted jointly with other participating agencies or under the National Oceanographic Partnership Program under section 7901 of title 10, United States Code.

SEC. 7. NSF OCEAN ACIDIFICATION ACTIVITIES.

(a) RESEARCH ACTIVITIES.—The Director of the National Science Foundation shall continue to carry out research activities on ocean acidification which shall support competitive, merit-based, peer-reviewed proposals for research and monitoring of ocean acidification and its impacts, including—

(1) impacts on marine organisms and marine ecosystems;

(2) impacts on ocean, coastal, and estuarine biogeochemistry; and

(3) the development of methodologies and technologies to evaluate ocean acidification and its impacts.

(b) CONSISTENCY.—The research activities shall be consistent with the strategic research plan developed by the Subcommittee under section 5.

(c) COORDINATION.—The Director shall encourage coordination of the Foundation's ocean acidification activities with such activities of other nations and international organizations.

SEC. 8. NASA OCEAN ACIDIFICATION ACTIVITIES.

(a) OCEAN ACIDIFICATION ACTIVITIES.—The Administrator of the National Aeronautics and Space Administration, in coordination with other relevant agencies, shall ensure that space-based monitoring assets are used in as productive a manner as possible for monitoring of ocean acidification and its impacts.

(b) PROGRAM CONSISTENCY.—The Administrator shall ensure that the Agency's research and monitoring activities on ocean acidification are carried out in a manner consistent with the strategic research plan developed by the Subcommittee under section 5.

(c) COORDINATION.—The Administrator shall encourage coordination of the Agency's ocean acidification

activities with such activities of other nations and international organizations.

SEC. 9. AUTHORIZATION OF APPROPRIATIONS.

(a) NOAA.—There are authorized to be appropriated to the National Oceanic and Atmospheric Administration to carry out the purposes of this Act—

(1) $8,000,000 for fiscal year 2009;

(2) $12,000,000 for fiscal year 2010;

(3) $15,000,000 for fiscal year 2011; and

(4) $20,000,000 for fiscal year 2012.

(b) NSF.—There are authorized to be appropriated to the National Science Foundation to carry out the purposes of this Act—

(1) $6,000,000 for fiscal year 2009;

(2) $8,000,000 for fiscal year 2010;

(3) $12,000,000 for fiscal year 2011; and

(4) $15,000,000 for fiscal year 2012.

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